YEAR BOOK 1939

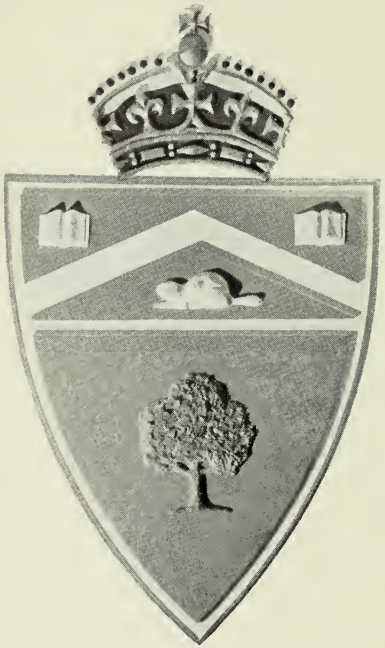
ENGINEERING SOCIETY

E UNIVERSITY OF TORONTO

TRANSACTIONS
AND
YEAR BOOK

ENGINEERING
SOCIETY

THE UNIVERSITY OF TORONTO



CONTENTS

M.R. MacPherson
EDITOR OF TRANSACTIONS

A.G. Gillespie
ASSISTANT EDITOR

W.V. Usatis
EDITOR-IN-CHIEF

J. Anderson
DIRECTOR OF PUBLICATIONS
AND PUBLICITY

F.P. Meschino
TORONTONENSIS REP.

F.C. Read
PHOTOGRAPHIC EDITOR

BOARD OF EDITORS
TRANSACTIONS
AND YEAR BOOK

Faculty of Applied Science
and Engineering

UNIVERSITY OF TORONTO

1938 1939

J.B. Moriarty
ADVERTISING MANAGER

H.L. Coons
SPORTS EDITOR

I. McCallum
ASSOCIATE EDITOR

ASHLEY AND CRIPPEN
TORONTO

TRANSACTIONS AND YEAR BOOK

of the

University of Toronto Engineering Society

~~No. 50.~~ APRIL, ~~1937~~

IT has been our duty and pleasure during the past year to record the events and highlights of School. In such a capacity, we have come to realize more fully the tremendous organization of which we are a part; and we have caught an intimate glimpse of the Schoolman at work and at play.

It was with a feeling of pride that we noticed the enthusiasm with which he entered into sports; anxious to be in the thick of it and just as happy when he lost as when he won. When he came out on top he said he was lucky to win and the other fellow certainly was the best he had met yet. When he lost, the other fellow was better; but he soon started laying plans for the next encounter when he might be able to prove himself more successfully.

It was often through sports, that he became acquainted with students of other faculties and engaged in friendly rivalry with them.

In his school work and studies there was the same enthusiasm. He argued, pondered and debated as he learned about the fundamental principles of engineering. He thought of the future and dreamt dreams of great engineering feats to astound the world. He marvelled at the skill and thought behind this great profession he had chosen. Sometimes he doubted his ability to take his part in the world and at the same time he longed for the day when he

would be an integral part of it. There were the times when he sat over coffee and talked of majestic affairs, while the professor expounded valuable theory and information to his more conscientious brothers in the lecture rooms.

Then there were the nights when he donned his finest raiment and gaily, with her beside him, he danced, sang and made merry often into hours of the day ahead.

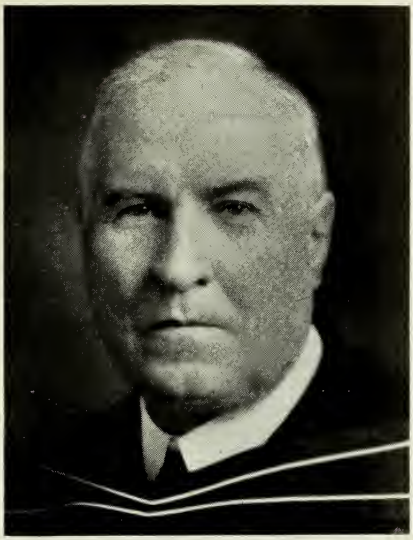
There are many other sides we saw of him, his hobbies of music, sailing, building, flying, pets and a hundred and one things.

These are some of the things we happened to glimpse and through it all ran a spirit, a vigour for life that belongs truly to the men of School.

The Board of Editors presents this Transactions and Year Book, as our recording of the Schoolman for the past year. To our assisting editors and many others may we extend our personal thanks for their invaluable assistance in making this edition possible. And finally to our successor, Bert Gillespie, we extend the wish for his every success in his coming task.

V. W. Usatis.

A Greeting from the President



I gladly offer good wishes to the members of the graduating class of the Faculty of Applied Science and am happy to know that this congratulation will be included in the "Transactions" of the Engineering Society. This publication illustrates the education that comes from the co-operation of staff and students, of graduates and students, and of students with students. It is a most helpful kind of self-education; it is the outcome of personal experience and experiment.

Your faculty is one of the most important in the University. It trains men in accuracy, thoroughness, resourcefulness and practical effectiveness; such qualities are among those most needed in the discharge of civic responsibilities. They make you natural leaders in your communities. Engineers have changed the material face of Canada and are helping to unite it to develop and conserve its natural resources and to improve general conditions of living. May you always be worthy of the fine traditions of your profession.

What is a profession? What is involved in a "professional spirit"?

1. In every profession there is a body of knowledge, partly inherited, partly growing in the present, which is so complex and extensive that skilled teaching and diligent and intelligent learning are necessary for mastering it.

2. The motive for work is not only the making of a personal livelihood, but the rendering of a public service. Duties must be placed before rights.

3. The standard of workmanship and effort must always be *excellence.* Nothing less than the best will do. Your works live after you, to praise or to condemn.

4. The discipline of the profession rests in the hands of its members. Beyond what the law of the land demands of all citizens, professional men are regulated by the public opinion of their professional comrades. By this exercise of fellowship discipline, standards are left high, and unethical conduct in relation both to the public and to the individual is restrained.

Service, excellence, self-discipline are among the notes of a true profession. Sound these out by your deeds.

You are entering on your life-work at a time of opportunity and challenge. The better your training, the greater your intelligence, the more indomitable your courage—the greater will be your chance of finding a worthy task or of making one. Whether your special field is technology, administration or salesmanship, be worthy of your best self, of your *Alma Mater* and of your country.

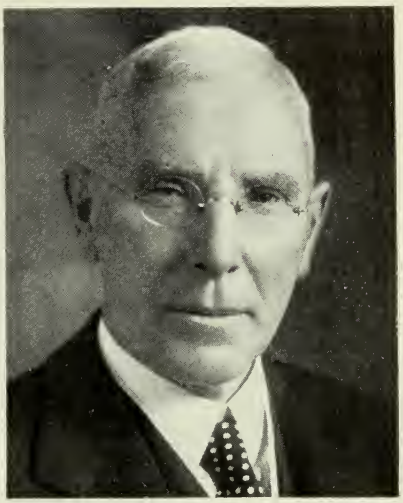
Canada is your birth-right and engineering is your duty.

Life never has been easy, never will be easy. Face it manfully. "Trust in God and do the right", and you will "have good success".

H. J. Cody,

President of the University of Toronto.

The Dean's Message for 1939



To the Members of the Engineering Society.

GENTLEMEN:

This year of the Engineering Society has been one of considerable success and progress. It is always to be kept in mind that the Faculty considers the operations and activities of the Engineering Society as an integral part of the Session's work very closely related even to the various courses laid down in our applied science departments. In this spirit it welcomes the great assistance and co-operation of the President and many Officers of the Society and its Clubs.

The Society, in carrying on its important functions of managing student activities, providing very useful programmes of papers, demonstrations and discussions on engineering subjects and of representing the Faculty in students' matters in the University generally, deserves great credit and in these respects this year will be marked as an outstanding one. The various Clubs have played a large part in these programmes and accomplishments and are also to be complimented. The activities of the Faculty Athletic Association have also been notable and those concerned in their management deserve much credit.

To you of the Graduating Class I offer best congratulations on what you have achieved in the past four years. I am sure all of you are glad you have been here, proud of being science men in this great university and proud of what you have learned and accomplished. You will leave to join the other four or five thousand graduates, proud of being "School" men and secure in the friendship and camaraderie of your fellow graduates. You will remember these four years as among the happiest in your lives.

To you who remain to proceed with your college courses, I also

offer congratulations. It is really worth while being here, being a student in this Faculty and, above all, being on the way to enter the happiest and the most interesting profession in the world. You are preparing to take a part in building a great country here in Canada. You will all have a better chance to do this than had your predecessors of twenty years ago, because the opportunities in front of you are greater, and are more diverse than in those days. So, in continuing your work here, I ask you to put your best into it, get the most out of it, get the most for your time, money and effort, for it certainly will repay you. The harder you work the finer the reward.

You are getting, also, much more out of your university life than that which is provided for in the curriculum or through the medium of the Engineering Society's activities. There are many other things that you are acquiring, some of them perhaps unconsciously. University life injects so much else, some of it tangible, more of it intangible, that it is difficult to apply any measure or formula. Perhaps, however, by this time, in whichever year you are, you are realizing this; I am sure you all are. Perhaps you are beginning to construct your own measure, to build up and apply your own formula.

New ideas, new thoughts, new methods of doing things, new applications of old ideas and new viewpoints are constantly presenting themselves these prolific days. There never has been a dearth of these and there certainly is no lack nowadays. If you keep receptive while here and after you get out, and indeed throughout your whole life, you need not worry about success in engineering and architecture, so far as originality and ingenuity are concerned. You may be sure these gain high marks in your professions.

Happy is the man who can snatch an idea, make with it his own application for a new situation in whatever field it may be, and turn it to universal use. So, do not be content to live through in a comfortable fireside kind of life. A professional man cannot afford to just go along casually or complacently. We must all now be geared to changing combinations of men and things and must adjust ourselves to this new order by being alert and receptive to fresh ideas.

To all years I offer best wishes for the coming year and to the Graduating Class, my best wishes as they go out into a new world.

Yours faithfully,

C. H. Mitchell,

Dean.

President's Message 1939

Relentlessly the hours have rolled by and once again the point has been reached when the Engineering Society takes on a new crew. It is to be hoped that the Executive for 1939-1940 will profit by the efforts and experiences of all who have preceded them and that they shall have as good a time making the wheels go around as those with whom I have been associated.

A mental review of the activities of that most democratic organization is quite staggering, the number of undertakings indulged in, covering as they do every phase of a Schoolman's mental, physical and social endeavours. To have been granted the privilege of having the opportunity to participate in furthering the cause of the Engineering Society is something for which I wish to publicly express my appreciation. The experiences and contacts afforded by it are something that have made School days ever to be remembered times.

The old saying that there is always room for improvement is one that has been amply illustrated this past year. You Schoolmen have indeed been fortunate in being represented by a group of what turned out to be really progressive thinkers. The bones of the Engineering Society were laid bare to public gaze and many

changes which you may have noticed have resulted from hot and heavy discussion by enthusiastic members. It is only to be regretted that there is not more time available to do a real thorough job and also that more men are not able to obtain the wonderful training afforded by such an organization.

While some of you may take such things for granted, every School function represents time, thought and energy spent on your behalf and it is only fitting that credit be given where credit is due. The three major Engineering Society events—School Dinner, School At-Home, and School Nite—have flourished this year under the careful guidance of Jock McArthur. The fact that next year's First Vice-President is being advised to start writing lab reports now, is an indication of the general state of affairs, but Jock's efforts were certainly not in vain. To have worked with someone so keenly interested in the success of an undertaking has indeed been a pleasure. The energy displayed by the members of his committees is a real tribute to his organizing ability.

The various class activities have been ably managed throughout the year by respective year presidents, Fred Walsh, Herb Coons, Croft Huddleston, who have also done their share of shouldering responsibility for other things as well. Charlie Dick, our President of 3T9, assisted by Bill Rapsey in the fall carried out that most important function, School Elections, with that same thoroughness which has characterized everything that has been done.

The backbone of our organization, the thing which does a great deal to unify the Engineering Society into a really live organization, is the Engineering Society Store. Under the management of Geoff Dewar and with the assistance of our two indispensable girls, Miss Dorothy Lowry and Miss Lela Davy, the needs of all you budding engineers have been satisfied once again. A look at the financial statement will tell you that a most astonishing amount of money passes through our little hole in the wall during a year. It is hoped that efforts begun this year will make it possible to have by next fall a complete re-organization of accommodation in the store. The service it performs is one worthy of a bit of attention.

This year in common with other things the Athletic situation has seen radical changes for the better under Jack Ford. The place occupied by School in interfaculty sports testifies very completely to the capabilities of your athletic president. The inauguration of the Athletic Banquet for prominent School athletes is an innovation which certainly is worthy of adoption as an annual custom.

The literary affairs of School have prospered this year, assisted

by that lively group, the Engineering Physcists, under the direction of Glen Campbell in *Toike Oike.* Some of the articles printed this year merited wider circulation than that afforded in our own Faculty. Bill Usatis as you can see by what is between these covers has done some thinking in regard to TRANSACTIONS, and he and his staff are to be congratulated on producing a book which you Schoolmen will find a real pleasure in the years ahead when your mind will start to look back at what used to be you.

The open meetings of the Engineering Society engaged considerable success and the attendance of you men has indeed been gratifying. While speakers were found to be scarce as hen's teeth, the men who took the time to come and increase our store of knowledge were really worthy of commendation. Our lecture on Polaroid was possibly a glimpse at a bit of industrial history in the making. The Club Chairmen in charge of arrangements overlooked no detail and special thanks are due our faithful songsters, Pat Partridge and Cy Read.

The coming Executive under Syd Dunn are a group which should without much difficulty make things hum this coming year. May every success accompany their struggles and may all you Schoolmen co-operate in helping to make things go better than ever before.

To every graduating man and every undergraduate I extend the very best of good wishes for a happy and prosperous existence and may the associations formed as a result of my School days be something I can carry on indefinitely into the future.

PAUL C. ANDERSON.

TRANSACTIONS
1939

ENGINEERING SOCIETY

THE UNIVERSITY OF TORONTO

Cavitation

BY ARTHUR D. SMITH

Condensed from the First-Prize Paper, at the joint meeting of the Engineering Institute of Canada, Toronto Branch, and the Engineering Society of the University of Toronto, on January 19, 1939

Theory

The study of the phenomenon known as cavitation began with its investigation by Osborne Reynolds, and his description of his work before the British Association in 1894. He observed this effect by forcing water through a small glass tube containing a restriction, or neck.

Without dwelling upon the research work carried on in the intervening years, let us examine some of the causes of cavitation and its basic principles, as they are understood at the present time. Without developing Bernoulli's equation it will be generally understood, that where the velocity is relatively high, and the velocity head correspondingly large, the pressure will be relatively low. Such is the case in the neck of Reynold's tube. Also it will be realized that even at room temperature, if the pressure upon a quantity of water be low enough, the water will turn from a liquid into a vapour.

Small particles of vapour are therefore formed in the water at regions where the pressure is below the vapour pressure of the water, which move with the flow to a region of higher pressure where they break down, changing again into water. Other, more specific aspects of the action will be dealt with when we discuss the results obtained from a number of years of investigation.

Importance

The importance of this problem lies in the fact that, when this breakdown of the vapour particles occurs, large amounts of energy are released which have a very destructive action upon any metal surface in close proximity to the break down area. By this means, particles of metal are removed giving the effect known as pitting. A very severe example of a pitted turbine blade is shown in figure 1. Here pitting has begun on the underside of the blade where the

pressure is low, and progresses right through the blade in several places. The impellers of centrifugal pumps, and the propellers of ships also suffer from this action. In many cases pitting is not nearly as bad as in the example shown, but it should be appreciated that where many millions of dollars are invested in the building of a power plant, or the launching of a great ship, even a roughening of the surfaces would reduce the efficiency in the first case, and decrease the thrust in the second, to an important extent.

It is natural therefore, to ask what is being done to ameliorate so serious a condition for the hydraulic engineer.

Use of Models

Two general methods of attack upon the problem of pitting of turbine blades have been used. The testing of turbine models has furnished valuable information upon the proper relations between the total head and the suction or draft head. The importance of the draft head will be appreciated when it is recalled that it is the low pressures which cause cavitation. Various pertinent facts have been determined in regard to the velocity of the water and the specific speed of the turbine. It has been concluded that to avoid cavitation there must also be no bends in the stream lines, which are too sharp; and no flat or hollow places should be left upon the surface of the runner blade.

A cavitation coefficient has been developed which indicates to the experimenter how nearly the conditions of operation approach

A Pitted Turbine Blade

to those conditions which would give cavitation; and valuable information has been secured by its use. The results obtained by the use of models are then, briefly, an improvement in turbine design to eliminate cavitation, and an increased knowledge of the desirable operating conditions.

Pitting Resistance Tests

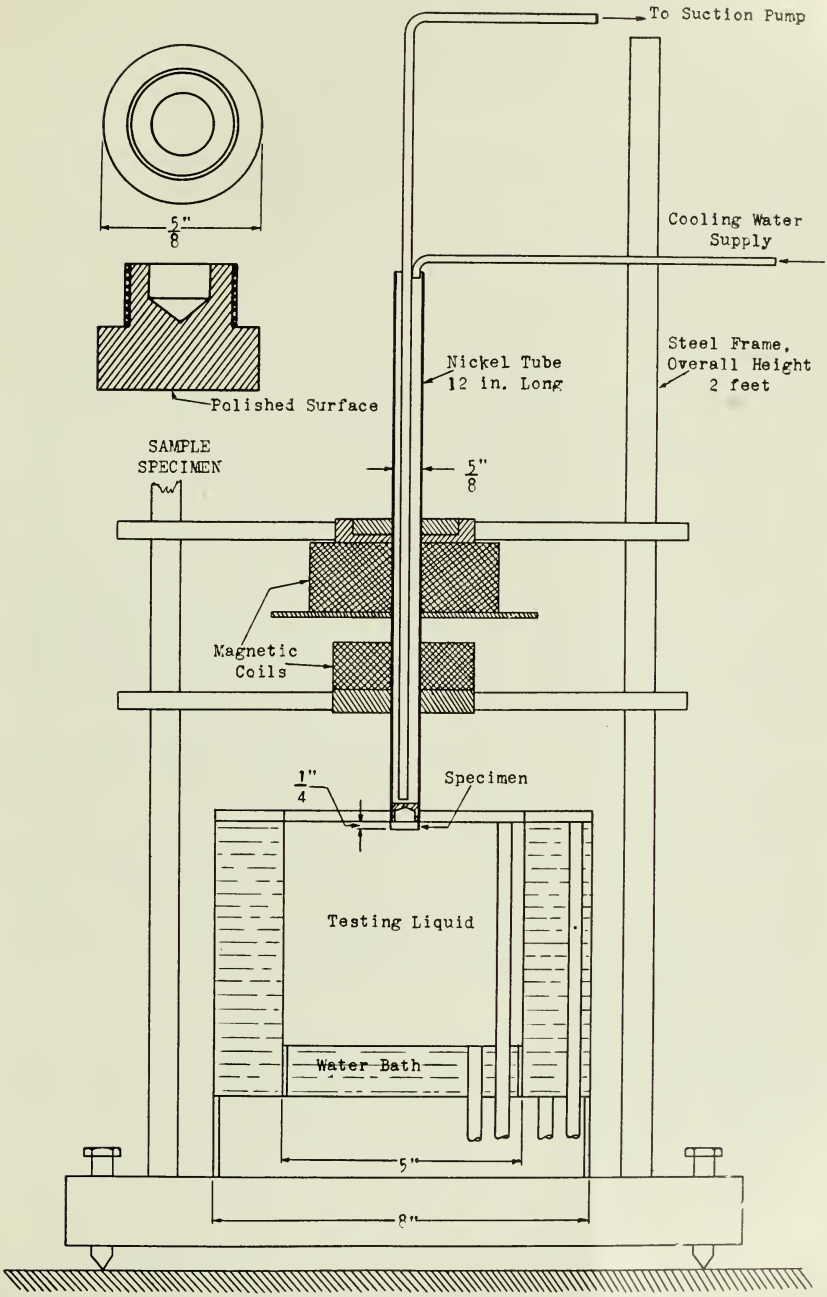
The problem has also been approached from another direction, namely: supposing cavitation to be present in a design, what type or composition of material will be most resistant to pitting when exposed to the cavitation action? The general method for such material testing is by means of the venturi instrument, having two parallel, and two divergent sides. It is rectangular in cross-section, but otherwise similar to a standard venturi.

Water is passed through the venturi, and vapour is formed in the neck and subsequently breaks down opposite the two specimens. The amount of pitting which results in a given time is a measure of the relative pitting resistance of that sample, and is determined by measuring the loss in weight. Sixteen hours would be an average time required to run a test by this method.

A more recent instrument for this same purpose is the vibratory testing machine perfected by The Massachusetts Institute of Technology, and sketched in figure 2. For this test the specimen is prepared disk shaped, 5/8 in. in diameter, and placed on the end of the nickel tube, so that its face is one quarter of an inch below the surface of the water in the container. By means of the two magnetic coils, the tube is vibrated in a longitudinal direction at its natural frequency. Standard conditions for the test were set at a frequency of 6690 cycles per second, and an amplitude of 0.09 mm. At the end of only two hours and a half by this method the specimen will be sufficiently pitted, due to the low pressures produced across its surface. This latter way is, therefore, quicker, and probably cheaper and easier to carry out. It has yet to be fully proved that the results obtained are as satisfactory as those by the other instrument; but indications seem to be that they are.

Conclusions

This work has been carried on over twenty years, and with increasing intensity in the last half decade; and the remainder of this paper will be devoted to a consideration of some of the conclusions which this work has enabled the experts to draw about



VIBRATORY TESTING MACHINE

cavitation. A series of pictures taken at 6000 frames a second illustrate very clearly the formation of a cloud of vapour, its breaking away, moving down the throat of the venturi and its subsequent breaking down. The final break down took only one six-hundredth of a second.

The actual means by which cavitation causes pitting is not fully understood. One theory suggests something similar to water hammer; and this is borne out by the observed lengthening of a piece of lead pipe, inserted in place of the specimen, as though by successive blows. Since air comes out of the water at low pressure, the particle at the time of break down is made up of air and vapour. The energy released by the collapse of the vapour may, according to another investigator, be transferred to the air which remains; and this particle of air then may lodge in a minute crack of the metal and finally explode, producing pitting. During the first few minutes of a pitting resistance test, the loss of weight of the specimen is relatively very little; and combining this fact with the observed beaten appearance of a specimen which has only been in a short time, leads to the conclusion that possibly first cold working, or plastic deformation occurs upon the surface of the specimen, until the fatigue strength is reached, then the surface breaks down and there follows a much more rapid destruction.

A proper amount of air admitted to the water (3 per cent. say), was found to provide a cushioning effect which prevented pitting under the action of cavitation.

A great many metallurgical compounds and alloys, ferrous and non-ferrous metals, welding materials, paints, sprays, surface treatments, and even such materials as rubber and bakelite have been tested for their pitting resistance qualities, and many conclusions can be found in the various reports on this work, which it is not possible to repeat here.

Although much has been done by way of experimentation, the real action is not fully understood as yet; and so we wish to conclude this paper by sounding the note that this important problem is not yet fully solved.

A New Profession

BY ALEC IRONSIDE

Winner of Second Prize in the Student Paper Competition at the joint meeting of the Engineering Society of the University of Toronto and the Debates Club, Faculty of Applied Science and Engineering on January 24, 1939

The profession referred to is that of the scientific criminal investigator. This is a new field which, of recent years, has just come into its own. Expanding as it is and will do in Canada, it provides openings for graduates of both the Science and Arts Faculties and it is hoped that several graduates will avail themselves of this latent opportunity in the near future. The profession is intensely interesting, very thought-provoking, and filled to the brim with romance. For a few moments then let us look at an investigator's job.

The whole basis upon which such an investigator works is to make a meticulous collection and survey of small clues of seemingly no importance, grouping these together, co-relating them, effecting logical air-tight deductions, and finally weaving them all together to form an indisputable web of evidence. This is presented and supported at the trial of the defendant and here the investigator's job ends.

Obviously to treat the many different types of clues with the proper and thorough scientific basis and background is beyond the scope and ability of a single investigator. Hence we have a surprisingly long list of specialists of which we quote a few, specialists in microanalysis, bio-chemistry, toxicology, blood stains, finger-printing, forgery, and ballistics.

In order to get a clear picture of this new profession to see how it observes clues, deduces facts, and draws conclusions, let us study one of these fields in more or less detail. For this purpose is chosen one of the more awe-inspiring portions of the investigation—that of blood stains. Probably ninety per cent. of all blood stains upon which investigation is made are discoloured, brown, grey, blackish or even greenish. An example of this changed colour can be seen any day upon the wrestling mats at Hart House. Actually they are covered with blood but the stains have a nondescript greyish hue and we dismiss them from our minds as the evidence of some-

body's dirty feet. We cannot, therefore, depend upon their colour as a means of identification so that we resort to a chemical colour test. There are several, the Benzedine, the Guaiac test and the Leuco Malachite test, the Benzedine being the most common. A saturated solution of benzedine in glacial acetic acid is prepared to which is added a few drops 1/10 N. sodium perborate solution. Any suspicious stain is given an application of the reagent, and the presence of blood is indicated by an instantaneous blue coloration. This test is extremely sensitive, to be exact about one part in 300,000. As an actual experimental fact a piece of cloth twelve inches square was stained with a small bead of blood. The cloth was then washed for one minute in one per cent. soap solution, thoroughly rinsed, ironed out, and the operation repeated fifty times. When treated with benzedine it reproduced the blue coloration. Boiling material for hours will not effect identification of blood in this manner. With respect to the age of the stain it matters little with benzedine. Blood clots appearing on mummies 5,000 years old dramatically produced coloration within five seconds in a laboratory test. There is one handicap in this test due to the fact that a few substances such as fresh fruit juice or milk will give the same colour. Therefore in order to be perfectly sure that it is blood an additional test is made in which ultra-violet rays are played upon the stain and, in the case of blood, give a beautiful brick red luminescence (due to the hematoporphyrin contained in it). There are also other infallible laboratory tests such as the production and the isolation of characteristic coffee brown hemin crystals from a stain.

Having established that the stain is blood can we identify it as of human or animal origin? Yes, it can be done. Blood is composed of red cells and of serum. Serum is the colourless liquid which can be separated in a centrifuge. If small quantities of sterile human blood serum is injected intravenously into a rabbit at specified time intervals an antibody is formed in the rabbit's blood stream. The rabbit's blood serum is then withdrawn, and when added in a small amount to human blood diluted with a normal physiological saline solution, produces a white ring precipitate which is specific for human blood with the possible exception of the anthropoid ape.

We now know that the stain represents human blood. The next step is to establish the identity of the stain. This problem can only be solved in a negative way. It can be definitely established that a specified stain does not belong to a specified individual. But

the converse is not true. It cannot be stated that a stain does belong to a certain person. From the view point of investigation, however, this negative proof is just as valuable as a positive proof.

Human blood of all races can be divided into definite groups, because of the ability of the blood serum of one person to clump, or agglutinate, or coagulate the red blood cells of certain other individuals. Landsteiner recognized this phenomena and declared it due to certain properties of the red blood cells called agglutinogens (A and B) and to those contained in the serums called agglutinins (a and b). He further established that these properties, like finger-prints were permanent, personal and indestructable. There are four groups, namely:

Group	Agglutinogens	Agglutinins
O.....	—	a and b
A.....	A	b
B.....	B	a
AB.....	A and B	—

Experiment shows that if a serum and red blood cells with agglutinin and agglutinogen properties designated by the same letter are mixed, there is coagulation of the red cells. In all other cases no coagulation takes place. Therefore serum from group one will coagulate red cells of the remaining three groups. Similarly serum from group two will coagulate only groups three and four, while serum from group four will not coagulate red cells of any group. By the process of elimination the grouping of a stain may be determined. By this means a man may be able to establish his innocence in a crime when the blood stain on his clothing is of a different grouping than that of the victim. The converse is not true, however, as the stain may have originated from any one of the millions of people having the same blood grouping.

Another application of increasing importance in blood grouping is in the determination of non-paternity in court. This work is based on Mendel's Law of Heredity and one must be familiar with the subject of heredity, in general, to engage in these determinations. According to the law which has been proved rather conclusively, parents of given blood groups will produce in their offspring only certain blood groups and definitely not others. It is only required to determine the blood groups of the parents and offspring and then to consult the table or law to see if such an arrangement is possible. A man accused of being the father of a child will be able to establish his innocence once out of every six times. Recently,

due to more advanced work, it is possible to help establish his innocenc in one-third of the cases if all the known factors are studied. Work on blood grouping has progressed so far within the last few years that Dr. Wilhelm Sangemeister of Europe can take blood specimens from twenty persons of the same group and state the origin of each.

Briefly, the criminal situation is this. Science has laid the splendid foundation which, with honest, efficient, police co-operation throughout the country, can competently and faithfully enforce the criminal law in Canada. The challenging fact, however, is that with the possible exception of the R.C.M.P. headquarters in Ottawa, there is no completely equipped crime laboratory in the country.

There are experts throughout the country which co-operate with the police but a systematic program of crime detection as would be the case in which laboratories were established at strategic points, has not yet been effected.

Even after attaining such an ideal arrangement the problem has only been scratched. The permanent solution lies in the study of crime prevention. Science shows that crime is due to a complexity of reasons which are interwoven with each other. A survey of prison inmates shows two-thirds of them to be below average mentality which again brings up the much discussed question of sterilization. It is interesting to note that in an Army Alpha test given to 1,000 Cleveland policemen only thirty-three per cent. were found to be of average intelligence, the remaining sixty-six per cent. were below normal, while twenty-five per cent. were regarded as inferior. Among the city's detectives three per cent. were found to be morons!

A Greek philosopher said long ago that a sufficiency of this world's goods was a necessary ingredient of the good life, which casts not a little reflection upon our economic policy. But the cause of the numerous American criminals compared to the comparatively few European criminals seems to lie in our system of education. Americans are insidiously educated by movies, advertisements, magazines, etc., to cherish the illusion that they have a right to be rich, handsome, well married, and leisurely. In part it is theoretically sound, but in part it is also psychologically unsound. Actually only one in a hundred attain such an ideal as it is limited by our economic set-up. There remain, still, the ninety-nine disillusioned people and it is in this disillusionment that crime creeps in. In Europe the peasant realizes he is poor and

arranges his psychological balance and avoids one of the tendencies to criminal degeneracy. The cure to such a set-up, as is evident in America, is almost overwhelmingly difficult. These educational forces are in business primarily to make a profit but so is the criminal. In fact it is estimated that the American nation is bled of approximately $14,000,000 a year.

In conclusion the situation obviously calls for a portion of the huge amount of money spent in crime detection to be used henceforth in a program of crime prevention. In the administration of such a program, it must be constantly kept in mind that criminals are both born and made.

Soph. vs. Frosh.

Electronic Tones as Developed by Hammond

Adapted from an address delivered before the Engineering Society of the University of Toronto on October 24, 1938, by G. W. Williamson of The Robt. Simpson Company

With the thousands of years tradition back of musical instruments as we know them to-day, we would naturally expect to find a high degree of perfection in them. But has this perfection been attained? From a scientific view-point, I do not think so. There is not an instrument that we know of to-day that will stay in tune indefinitely, nor is there one that is not subject to atmospheric changes. The violin, a well-known instrument, is very susceptible to humidity, and instruments employing a column of air such as the wind organ, are subject to temperature and atmospheric pressure changes.

However, due to the engineering ability of Mr. Laurens Hammond, an electrical instrument has been developed that is not subject to climatic changes and will not get out of tune. It is called the Hammond Electric Organ.

The sketch below is a drawing of a tone generator as employed in the Hammond Organ.

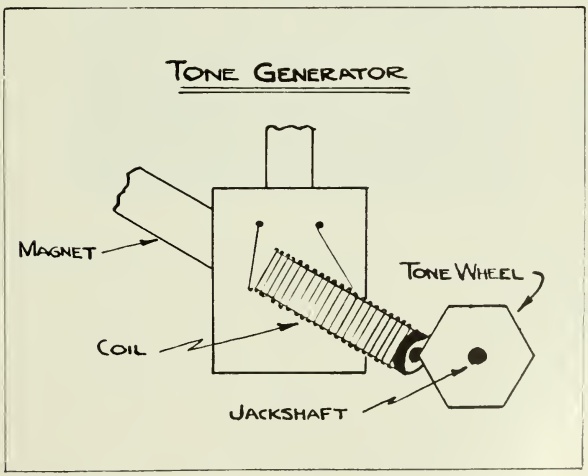
As will be seen, it is of extremely simple construction. It consists of a magnetized iron bar, about four inches long and a quarter of an inch thick, a pick-up coil which is wound around the bar, and a tone wheel which revolves with the outside edge coming very close to the end of the bar. This tone wheel is mounted on a jack shaft which is driven through a gear ratio by a main drive shaft which revolves at a speed of 1200 R.P.M. which is, in turn, driven by a synchronous electric motor. Since all induction type motors do not run at an absolutely smooth speed, but by a series of impulses, the motor is coupled to the drive shaft by a spring coupling and the jack shaft is coupled to its driving gear by a similar coupling and finally the tone wheel is mounted on the jack shaft by a spring clutch.

This tone wheel has a series of flat sides with humps or teeth between them. As the tone wheel revolves and a tooth moves within the magnetic field of the magnet, it disturbs the magnetic flux of the bar and thus sets up a slight alternating current in the coil. This constitutes one cycle. Since the wheel revolves at a definite speed and is equipped with a definite number of teeth,

it follows that a definite number of cycles will be generated in the coil per second. Thus a frequency is generated. There are ninety-one frequencies in all, and they are obtained by running the tone wheels at any one of twelve speeds as determined by gear ratios and equipping them with any one of eight numbers of teeth. For instance, there are twelve wheels with 2 teeth, 12 with 4, 12 with 8, 12 with 16, 12 with 32, 12 with 64, 12 with 128 and finally 7 with 192. The ninety-one frequencies range from 32.69 cycles to 5273.6 cycles per second.

The wave-form produced by this note on an oscillograph screen is of a perfect sine character. The shape of the teeth on the tone wheel determine to a great extent the wave-form produced. As a matter of fact, during the experimental stages of this instrument, it was found oxidation forming on the tone wheels affected the wave form considerably. A light coat of lacquer on the wheels remedied this trouble. This will illustrate how carefully the tone wheels have to be machined.

It is known that every musical tone is made up of a certain portion of fundamental tone together with a balance of one or more harmonics. The Hammond Organ accomplishes this idea through a set of harmonic controllers which allow the organist to build a variety of tone colours through changing the balance of harmonics with a certain strength of fundamental. In this way it is possible to build, for instance, a clarinet tone. Then by changing the harmonic balance, an oboe tone or a characteristic organ tone as the diapason can be produced.



From this it can readily be seen the Hammond Organ is the first musical instrument ever developed which gives the organist the possibility of building his own tone colours. As each harmonic controller has eight degrees of intensity and there are nine controls duplicated four times and any number of preset combinations can be had, it has been estimated the possibilities for tone variation amount to 253,000,000. In other words, the performer has practically an endless number of possibilities at his command.

It is interesting to note how the harmonics with their eight degrees of intensity are obtained. It is really very simple. Located below each set of playing keys are nine bus-bars laid in parallel rows, when a playing key is depressed nine spring contacts are connected to each of the nine bus-bars. To each of the nine contacts, is wired a fundamental tone generator and tone generators generating frequencies that are harmonics included in these eight frequencies are a sub-fundamental and a sub-third harmonic. When a switch key is depressed the nine frequencies are connected to a set of nine drawbars. As a drawbar is pulled out it contacts nine bus-bars in turn, the first of which is zero, and the remaining eight provide eight degrees of intensity. These bus-bars are connected to nine taps on the primary side of the matching transformer, this provides eight degrees of intensity, the first one being zero. All the harmonic drawbars make contact to these bus-bars when pulled out.

A pleasing feature of the Hammond Organ is the chorus generator, this generates tones in the same manner as the main generator but there are only thirty-six of them. When the black draw-bar at the extreme right end of the console is pulled out it operates a multi-contact switch which connects the thirty-six chorus tones to frequencies 56 to 91 of the main generator. The chorus tones are almost but not quite the same frequency as the corresponding main generator tones; they are actually 8% to 4% off frequency. The resultant beat produces a pleasant undulation effect.

The method devised for varying the general volume of the organ consists of the swell pedal which although much like that of the conventional pipe organ has a range three times that of the wind organ. It consists of a variable rheostat shunted across the secondary of the matching transformer, so that when the resistance is least the volume is least and when the resistance is at maximum the volume is accordingly at maximum.

The Hammond Organ incorporates another idea of the wind

organ in the use of a tremulant. This is accomplished by a rheostat that is driven off the opposite side of the motor, and is therefore constantly in operation. The rheostat is constantly opening and closing the circuit into the amplifier in graduated stages, thus varying the intensity of the volume. This is shunted by a manually operated rheostat permitting the organist to control the amount of tremulant effect.

This type of tremulant does not alter the pitch, but only the intensity.

From this point on the electrically generated tones are transmitted to the pre-amplifier which drives the audio-amplifiers located in the tone cabinets with the speakers through a two hundred ohm line. Each amplifier is capable of delivering 20 watts and drives a pair of auditorium type dynamic speakers. It will be noted that until the electrical impulses reach the voice coils of the speakers, there has been no sound produced only electrical energy.

While it is possible to produce beautiful and enchanting effects with this instrument it should be remembered that it was only made possible by engineering skill.

(The address was followed by a demonstration of novel effects with explanations by Paul Berg.)

Misty Morning

Future of Pulpwood in Northern Ontario

BY G. THOMAS PERRY

Winner of Third Prize in the Student Paper Competition at the joint meeting of the Engineering Institute of Canada, Toronto Branch, and the Engineering Society of the University of Toronto on January 19, 1939

In a manner that is quite logical, it is necessary to first build up a background of facts, before an attempt is made to prophesy the future. So before entering into rash or blatant statements, it will be in order to review some of the history of the pulpwood industry.

As a means to this end, it will be necessary to go back to the time when the lumberjack was a figure of glory and romance in the Eastern States of the Union. Due to the indiscriminate exploitation of pulp forests in the United States, the industry soon faced a dearth of pulpwood. It should be borne in mind, that at this time, which was in the latter decades of the preceding century, the wood used for pulp consisted entirely of the conifers, Spruce, Hemlock and Balsam. Any stand of deciduous wood fell before the woodsman's axe, and was left to rot, or the land cut was fired to remove this undesirable material, thus destroying any possible re-growth.

The dearth that followed as a natural outcome of the exploitation, forced the Americans to come to the Dominion for their pulpwood. Cheap power was also one of the factors in favour of this migration of interests.

In the period 1900-1911, there was a prohibition of the exportation of pulpwood cut on Crown lands. This, coupled with certain advantages, such as waterways and water power, was the determining factor in the swinging of the economic balance to the point where it was profitable to build pulp and paper industries within the Dominion. Many such industries thus sprang up at points where there was easy accessibility to either pulpwood or cheap transportation of the wood.

Due to these facts, the industries in Ontario became located in two definite centres, namely, the northern shores of Lake Huron and Lake Superior, and in the Niagara Peninsula. This was only logical. Timber cut in the Northern Forest could either be brought down the rivers to the mills, and there converted to pulp and shipped

by boat as such, or shipped as logs cut to length, to the mills in Southern Ontario, which, clustering around the Welland Canal, were in an excellent position for the exportation of pulp and paper to either the United States, or to Great Britain.

In Ontario, the total land area is covered to the extent of 65.5% with timber. This is confined to the northern part of the province and is part of the Great Northern Forest which covers the Dominion from the Maritimes to the Yukon. Of this enormous acreage, only 31% is available for industrial use as pulpwood.

Instead of profiting by the experience of pulpwood depletion in the United States and attempting to preserve the stand of timber, exactly the same methods were used in this country. The Leitmotif of the timber camps seemed to be: "Cut it all down and get out what you can, and what you can't—forget about!"

In 1924, the largest company was the Spanish River Pulp and Paper Mills Ltd. They were situated at Espanola, Sault Ste. Marie and Sturgeon Falls. This district was the new centre of the pulp and paper industry and this one country, alone, controlled an area of some 21,000 square miles of timber. This area is almost equal to that of the Province of Nova Scotia. As a unit, it was turning out some 700 tons of newsprint per day. In round numbers, that would mean 120 acres of timber to be cut per day on their combined holdings.

At Kapuskasing, there is the Spruce Falls Co., which was then milling 120 tons of sulphite pulp per day, and on the Ottawa, the Abitibi Power and Paper Co., with a production of 500 tons per day.

On the Niagara Peninsula, there were worthy of note, the Interlake Tissue Mills at Merritton and the Ontario Pulp and Paper Co., at Thorold, which company has played an interesting and unique role in the forming of the future of Ontario's pulpwood industry. Thus, will be seen the enormous demands that were being made on the timber reserves of the province.

This method of using the natural resources of the country without thought of conservation, led ultimately to disaster, a disaster that reached rather alarming proportions. As previously stated, only 31% of the forest reserve was available for pulp and of the total resources 20% had already been disposed of, and this 20% was the area that contained the bulk of the attainable pulpwood. That is, the Spruce, Hemlock, and Balsam. Therefore, as a result of this, the pulp industry began to decline rapidly, leaving behind, barren rocky lands covered with scrub growth, underbrush and with monuments of its past glory in rusty iron, like those to be

found at Sturgeon Falls and North Bay. The country had just been cut clean with no thought of preservation or reforestration.

Soon after this period, there came the great financial upheaval in 1929-30. As in all industries, the pulpwood felt the shock and promptly proceeded to curtail production to meet the dwindling demands of a shrinking market.

The engineers and research experts soon found that their skill was to be taxed to the utmost to devise cheaper and more efficient methods of production, utilization of waste cellulose and the formation of cheaper pulps from the broad leaf or deciduous woods.

As an example of this, it is only necessary to turn to the paper mill on the Don River in Toronto. Two chemical engineers, employed there brought out a method for the utilization of the slashings from the main cut of timber, for pulp. These were originally left on the cleared land, or fired, if time warranted it.

About this time, a new threat to the industry in the province was beginning to make itself felt. Far to the South in Georgia, there grew a very soft, resinous type of pine. This tree was thought to be useless and a blight on the face of the earth, until a research chemist and engineer produced a pulp from the young pine, that rivalled that of the Northern Forests. As long as the wood of this tree was cut under three years of age, it had excellent pulping qualities, but, would it stand the strain of modern high-speed newsprint presses? The answer to this question was an emphatic no, from all pulp and paper companies except one. That was the Ontario Pulp and Paper at Thorold. They thought that the answer was—maybe! They tried this new type of pulp and found the answer to be—yes! From this there sprang up a flourishing pulp and paper industry in the Southern States, especially in the manufacture of Kraft papers. The unique peculiarity of this Georgia pine was, that the timber growth was so rapid, that it could be rotated like crops of grain. It only took three years to produce a crop of pulpwood made from Georgia pine, as against 15-25 years in the Northern Forest. Thus another market was greatly curtailed and the future of northern pulp became a little darker.

Ontario produces approximately 37% of all the pulp in Canada, which represents as a whole, a capital investment of some $500,000,000 for the Dominion. Almost 90% of the pulp produced is shipped to the United States as newsprint. So, ships bearing pulp from Norway, Sweden and Finland were viewed with no small alarm, when they appeared in New York harbour. These countries, due to methods of production and a favourable monetary exchange

rate, are shipping pulp to the States at a more economical rate than our northern mills can compete with. Here is a definite problem for our engineers and financiers. If they cannot compete with conditions like this, then the future of northern pulp will remain in the *status quo.*

The big pulp and paper industries have learned their lesson in forest preservation, and are now cutting no more than the annual growth from their timber stands. In fact, the annual cut now runs about 1.3 million cords and the annual growth 1.8 million cords. The 0.5 million cords difference is taken care of by fire and fungus, two problems which are the nightmare of the forestry men. It is interesting to note at this point, that in Finland, pulpwood industries are allowed to cut no more than the annual growth by statutory laws. Due to similarity of growth conditions, Finland has recently sent over experts to study our methods of pulp production.

To return now to the northern forests, devastated by axe fifteen years previously. What has happened there? While man has been struggling with his financial, industrial and political conundrums, Nature has been quietly working away and unlike man, has accomplished results and is showing a prospect that augurs well for the future. The land has, without any synthetic aid, reforested itself with a healthy stand of coniferous wood such as spruce and balsams and also a fine stand of hardwood such as

Who Owns the Legs? School Night.

birch. Now, birch, it will readily be admitted, has not the pulping qualities of spruce and hemlock, but used as a soda pulp, it has properties that make it valuable for the production of fine papers, such as those which are exclusively manufactured by the Howard Smith Mills.

The question immediately presents itself, "What is the present economic value of this renewed source?" And, of course the answer is, "Of no value at all for the present or for the immediate future."

However, the topic cannot be dismissed at this stage. There are several important points that have to be taken into consideration and brought forward for careful valuation.

It is common knowledge that the pulp and paper industry is at present producing on a greatly reduced schedule; but, can any clear thinking individual believe, that, even with the unsettled times now being experienced, this schedule will be maintained at the present level? No! By industrial evolution, progress and expansion will again take place. Will the companies now producing, cut more than the annual growth from any timber holding? Not now that they have experienced the results of the economy of preservation. Hence new fields for pulpwood will be sought and then the Northland will be ready, prepared by Nature in those lean years when men were forced to take stock of their own incapabilities.

As a forerunner of the returning value of the northern timber, some of the saw mills at North Bay, which had been idle for years, recommenced operations during this past summer of 1938.

These considerations alone would warrant the future for the pulpwood industry in Northern Ontario, but there are other reasons that have yet to be taken into account.

Within the last few years, there has come to the fore in the industries of Canada, one, which has a direct bearing on the utilization of pulpwood. This is the manufacture of Rayon and Artificial Silks. Here is an industry, that, in spite of adverse conditions, has been advancing steadily, if not in a spectacular manner. The possibilities of this industry in Canada were of sufficient proportions to lure one of the largest Rayon manufacturers of England to this Province, namely, "Courtald's", now operating at Cornwall, on the shore of Lake Ontario.

Here is an industry in which great efforts are being made through research and applied science to bring about improvements, and any person with the capacity of looking ahead will readily perceive, that this industry will be one of the staple industries of

the country. As C. A. Furnace, that great chemical engineer from the States has said, "An engineer must hang his head in shame, as long as he is bettered in the production of milady's gowns by a mere worm." There is a great deal of truth in that statement and the day will come when the engineer will be producing a textile material that surpasses natural silk—and the raw material for that will be cellulose, or if you will, pulp. Here then will be another great demand for pulp-wood, and as with the pulp and paper industry, these rayon industries are going to take their pulpwood sanely from the forest and not by the methods of the early days. These sane methods will again mean the utilization of pulpwood forests in the North, that have been, and are being prepared by Nature.

Another, and perhaps still far distant possibility in the utilization of this natural resource is the production of sugars, and industrial chemicals such as sodium acetate. These have not yet been taken out of the laboratory, except in Germany, where cellulose, in the form of wood pulp is converted into sugars by large scale production methods for cattle food, and is one of the many "ersatz" products which are often mentioned in current literature.

Therefore, casting a prophetic eye to the future, and keeping a steady view of past and present accomplishments, there is a definite reason for firmly believing that the future will unfold immense possibilities; industrially, by the construction of new plants, economically, by the resulting influx of invested capital, and socially, by a general raising of the standard of living conditions as a direct effect of this capital. This will be the future of the pulpwood forests of the northern section of the province, which contains one fifth of the total available material for pulpwood in the Dominion—truly a natural asset.

Science in the Foundry

BY WILLIAM BRUCE

Winner of First Prize in the Student Paper Competition at the joint meeting of the Engineering Society of the University of Toronto and the Debates Club, Faculty of Applied Science and Engineering on January 24, 1939

You will realize that the discussion in detail of any one phase of this subject would require much more time than is at our disposal. It will be my endeavour therefore in this paper to cover the ground in a general manner showing how knowledge acquired from various branches of science has been applied to foundry practice and the results which have been obtained.

Founding is one of the oldest of the industries and the casting of metals into predetermined forms continues as a fundamental art and craft in the diverse and complex mechanical age of to-day. The products of the foundry are found in every industry; they provide the sanitation, comfort and health prevalent in the home. Here are a few examples of the uses of castings and notice the extensive field which they cover: automobiles, railway cars and locomotives, agricultural implements, mining machinery, bells, kettles, furnaces, pipes, valves, fittings, domestic aids such as glass jars, printing machinery—it is interesting to note here that the modern printing machine is over fifty per cent, by weight, cast materials and to conclude this list machine tools in the manufacture of which castings play a very important part.

The remarkable progress and development of the foundry industry since the turn of the century is due to the application of scientific knowledge gained from study and research. All establishments of sufficient tonnage now have their own laboratories and the smaller jobbing foundries call upon the commercial laboratories as required

It was not until the invention of gunpowder in the Middle Ages which brought about a large demand for cannon that the foundry industry was thoroughly established. During this period up till the close of the eighteenth century, cannon and stoves were the most important products and as long as the cannon did not burst during the first dozen discharges and the stoves did not crack when first lit, no one worried about the metal in them. No changes were

evidenced until the advent of the steam engine in 1870. This invention made available unlimited quantities of coal from flooded mines and a new epoch was introduced in the art of melting iron. At the same time it also brought about the need for more reliable castings. This resulted in the first attempt at grading metal, which was to fracture it and select that with the most uniform structure and suitability. Such a method was unreliable, and as the requirements of the machine shop and service demands became more exacting the modern foundry advance was forced on the industry.

The change in the demand of grading pig and cast iron was one of the first aids rendered by science. Standardized borings were taken for laboratory checking, the judging being a definite one of actual elemental content. Then came the study of the chemical and physical properties of cast iron and developments along the lines of foundry betterment such as lighting, heating, ventilating, safety, efficiency and foundry education. The classification of castings by chemical composition also was found invaluable in the steel foundry. It eliminated the confusion which existed among buyers when specifying the desired qualities of the product.

The advances made in the study of metallurgy have produced vast improvements in the qualities of metals and this is especially true in the case of gray iron. Gray iron, although long recognized as an engineering material has recently come to the fore because of its improved physical properties and because it is possible to control and reproduce these properties at will. Its low cost makes it a valuable material in engineering design and service. Our modern civilization almost entirely depends on machine tools for the production of the necessities and luxuries of life, but progress in the machine industry is due in great part to the improved qualities of gray iron. Greatly increased cutting speeds resulting from the introduction of new types of cutting tools have provided a demand for machine tool castings possessing high tensile strength and this demand has been met with gray iron and its alloys.

Alloys are combinations of metals either in the form of mixtures or chemical compounds and have been known from the earliest times but as their properties cannot be judged by those of the components their technology was acquired only by experience. Two castings may have the same chemical composition but possess entirely different physical properties. The investigation of solid alloys is now carried out by what is called metallography and the reason for the variations is apparent to the metallographist. They are due to differences in the physical structure of the metal.

Metallography consists of polishing the alloy perfectly and examining it under the microscope, usually after very gentle treatment with a chemical reagent which changes the various constituents differently. The effect is to enable the different types of crystal present to be detected. The exact constitution is given by such an examination and on this basis the study of the solubility of metals in one another was undertaken. From the information gained an accurate analysis of the properties of an alloy is obtained. The field created by this branch of science is unlimited and further exploration in the metallographic laboratory will result in the development of alloys with properties which will far excel those of to-day especially in heat resistance. The scientific development of alloys has brought the foundry into greater prominence in that it can supply industry with a type of casting to suit every need.

Great success has been met in alloying gray iron with other metals, with a broad range of properties being made available. Cheapness accompanied by satisfactory results makes it a real asset to industry. Tensile strength ranges are obtained from 20,000 pounds per square inch to 60,000 pounds per square inch, with a hardness of 100-500 Brinell. Alloy irons are being made to withstand a temperature up to 1650°F. The increase in heat resistance due to the alloying materials is quite great as plain iron begins to grow at 650°F.

Alloys find special application in the production of automobile brake drums, cam shafts and crank shafts. Another use is in the construction of machinery which handle food supplies to prevent contamination of the products which come in contact with the metal parts. Nickel, chromium, cast-iron dies are used extensively in the automotive and sheet metal industry because they are strong and hard yet machinable, possess a fine grain and assume a high polish, eliminate galling and streaking of the metal formed, wear longer and are more economical than plain iron or steel dies. A large part of an enormous volume of equipment such as pipes, pumps, and valves used in the petroleum industry and paper mills is constantly subjected to corrosion and deterioration. An alloy of cast iron, composed of 14% nickel, 6% copper and 2% chromium is used to make this equipment and is very resistant to corrosion.

Alloys also play an important part in the steel and die-casting foundries. Plain carbon and special alloy steels are now being produced economically with tensile strengths ranging from 60,000 pounds per sq. in. to 200,000 pounds per sq. in., and at the same time allowing a degree of ductility and shock resistance adequate for any

prescribed purpose. It has been found that the use of zinc or zinc-base alloys in die-casting gives castings with better physical properties and permits high pressures to be used so that wall thickness may be reduced to a minimum and a saving in material obtained. The thinnest cast wall at present in zinc-base die-castings is on a spark plug shield and is 0.0155″ thick. Such castings also find use in clock cases and automobile horns.

A few years ago it was quite customary to see hundreds of castings piled outside a foundry building. They consisted of cylinder blocks, surface plates, planer beds, etc., whose finished dimensions must be permanently accurate and they were undergoing air seasoning or aging. This exposure to atmospheric temperatures for very long periods resulted in the stresses in the castings being gradually relieved. Since cooling rates even in simple sections are not uniform throughout different parts usually tend to contract different amounts. In certain cases there arise conditions wherein at a given time some parts may be contracting and others expanding. The result is the creation of internal stresses with consequent likelihood of warpage or even fracture. Again, scientific investigation produced a much better and more economical method which takes only a fraction of the usual time. The process is called heat treatment and consists of heating the casting to a moderate temperature and cooling slowly. It was also discovered that heating to different temperatures and cooling at different rates greatly varied the properties of the metal and so castings are now heat treated for any one of three purposes:

(1) to relieve internal stresses
(2) to decrease the hardness and improve machinability or
(3) to increase the hardness for wear resistance.

The study of the properties of the different constituents of moulding sands and their effect on the production of sound castings has resulted in the development of special apparatus for testing the sand and keeping it to an exact composition.

There are quite a number of tests but the moisture, permeability, compressive strength, sintering and fineness tests are the most useful. Moisture plays an important part in moulding sands for when mixed with clay it provides the bonding quality. Too much moisture causes steam and other gases to form in the mould which are detrimental to castings causing blow holes. The moisture content is expressed as a percentage of the weight of wet sand. The sand must have sufficient strength to retain the shapes of the

moulds until the metal has solidified therefore the compressive-strength test is used to measure the bonding property. Permeability which determines the rate at which gases escape from the mould is measured by the rate at which a definite volume of air, under a given pressure, passes through a standard specimen. The sintering point is valuable to know as a low sintering point causes the sand to burn on to the casting.

These tests provide for efficient sand control. A record of physical properties can be made so that results may be duplicated and it affords a ready means of judging new sands. The most important feature is that the condition of the sand pile may be determined and corrected before it obteriorates to the point where bad castings are produced. Careful control of foundry sand properties results in lower sand costs, fewer losses and improved casting surfaces.

The health of the workman is an important consideration in the modern foundry and science has contributed greatly to the prevention of silicosis. Investigation has revealed that the properties of the dust which determine its capacity to produce damage are the composition, concentration and particle size. Instruments have been constructed to determine the concentration of dust present in the air. The size of the particles is measured by micro-projection and the composition found by chemical and petrographic methods. The dust present in the foundry arises chiefly from the cleaning and grinding of castings. Ventilating equipment assures an adequate supply of fresh air and gets rid of the obnoxious gases. The adoption of dust control measures good operating procedures and effective mechanical equipment tend to produce more healthful surroundings for the workman far in advance of foundry conditions which existed some years ago.

Thus it can be seen that modern foundry practice combines the knowledge of many branches of science and applies it in such a manner as to improve old methods and create new ones, to produce high quality products and provide efficient economical production. Constant research and installation of modern equipment enable the foundry to keep abreast of advancing demands which are becoming more rigorous and exacting and to meet the increasing competition from other methods of fabrication.

Mr. Hoover---C22

November 22nd, 1938

Through the capable and energetic efforts of our Art Kingsmill, Schoolmen were permitted to see and hear one of the foremost mining engineers and statesmen of our time, Mr. Herbert Hoover.

Although not actively engaged in the profession of Mining Engineering, Mr. Hoover showed a keen interest and understanding of the advantages and rewards of the profession. In translating Agricola's work on Mining he found that conditions in the 15th century had not been noticeably improved upon up until the present time. Lawyers still quarrel violently, doctors still revel in others' misfortunes, and the politicians continue to extract their living from the poor, thus proving Mining Engineering to be the only constructive profession of them all. Besides being the most constructive, he showed it to be the most interesting and educational life on our mining frontiers, holding all the elements of surprise, interest, adventure and misfortune so necessary in the development of the industrial and scientific leaders of the world. In no other branch of engineering can such a varied background be gained. Thus it was pointed out by Mr. Hoover that the mining engineer was the man most adequately and abundantly equipped to direct the affairs of the nations of the world; they bring quantitative intellect into the qualitative realms of government.

With these encouraging remarks ringing in the ears of every miner, Mr. Hoover closed his address with congratulations to the group on the choice of their profession. A hearty vote of thanks was proferred by Bill Usatis and unanimously seconded by the notable assemblage.

Diesel --- Electric Buses

BY ROBERT BOYD

Condensed from Thesis submitted for the degree of B.A.Sc. in Mechanical Engineering

Introduction

Electric drive is not new. Ever since it was found that a direct current series wound motor could deliver its power output in a very wide speed range, at a constant power input, designers have considered and used this type of motor for traction service. Street cars use series motors, and it is not strange that the possibility of using these motors on buses should have been considered. However, until about twelve years ago, mechanical transmission, consisting of the familiar sets of years, giving several ratios, was used exclusively. The transportation industry was relatively young, and the need of smoother operation and higher acceleration was not felt.

However, at the present time, diesel bus operation is much more desirable. There are three reasons for this. First, diesel fuel contains more energy per gallon than does gasoline. Second, diesel fuel costs considerably less than gasoline in most parts of North America. Third, diesel engines are more efficient than gasoline engines, because of their higher compression ratios, and because the average temperature during combustion is closer to the maximum cycle temperature. The type of diesel engine used for bus propulsion has, unfortunately, a rather narrow speed range, from about 500 to 1800 r.p.m. So, if an attempt were made to use mechanical transmission in a diesel powered bus, as many as seven forward speeds would be required. With as many forward speeds as this, it is seen that the care and skill required from the driver is much more than is desirable, so it may be concluded that if the advantages of diesel bus operation are to be realized, electric transmission must be used.

Theory of Drive

A diesel-electric bus has three power units. First, a diesel-power plant. This engine is of a multi-cylinder type, and has the usual auxiliaries incident to its operation, as fuel pumps, starting motor,

etc. Second, a direct current generator. This is driven from the engine shaft, and supplies the electrical energy for driving the third unit, the series motor. This motor drives the rear wheels through a standard differential gear assembly.

Referring to the wiring diagram (Fig. 1), the operation of the drive may be examined. The generator is slightly compounded, but the effect of the series field is relatively small, and it will be neglected in the following discussion, the generator being considered as a shunt wound device. To start the bus, the operator has merely to release the brakes, and to depress the accelerator pedal. This speeds the engine and generator up to the maximum speed of about 1800 r.p.m., this speed being limited by a governor. Also, depressing the accelerator pedal closes switch A in series with the battery. This throws the battery in series with the shunt field, giving a high field excitation. This enables the generator voltage to build up almost at once, causing a high voltage to appear across the motor terminals. The large current produced by this voltage gives a high motor torque, accelerating the bus at a high rate.

As the bus speed increases, the motor current decreases, allowing the generator voltage to increase still more. At some predetermined voltage, the current passing through the winding PR of the potential relay is sufficient to cause its contacts PR, in series with the battery, to open. This removes the external generator excitation, and the generator continues operation as a self excited machine. Resistor R_3 is used to adjust the amount of battery excitation while accelerating. If the bus starts to go up a hill, the greater power required will cause its speed to drop. This will increase the load on the generator and engine, causing these units to slow down as well. It is seen that the motor requires a high current at a lower voltage than normal. To obtain this, the operator depresses the foot switch B, increasing the generator field resistance from R_1 to R_1 plus R_2. This reduces the field excitation, allowing the motor current to be supplied at a lower voltage than normal. At the same time the load on the generator is decreased, allowing it to speed up once more to the operating speed in the vicinity of 1800 r.p.m.

A three-way power switch is provided in the motor series field circuit, allowing the bus to be reversed. A magnetically operated interlock is provided for this switch to prevent reversal of the motor when the generator voltage is high enough to cause the commutator to flash over. The generator voltage when idling is only one or two volts. The torque produced by this is very small, so ordinarily the power switch is left in the "forward" position during stops.

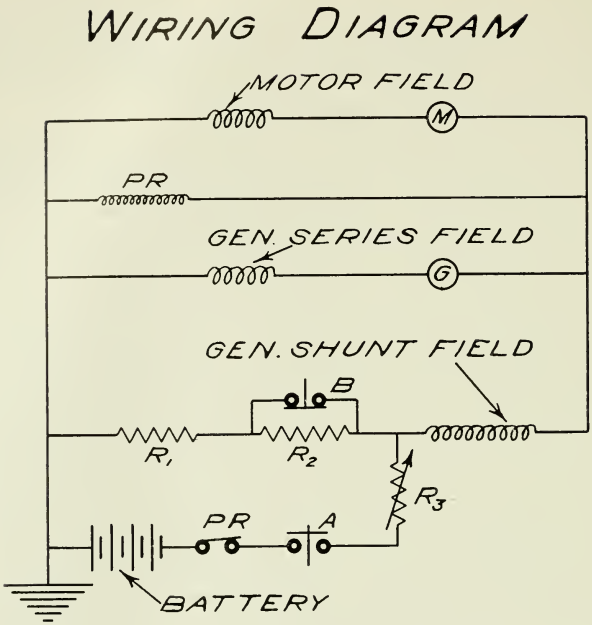


FIGURE 1.

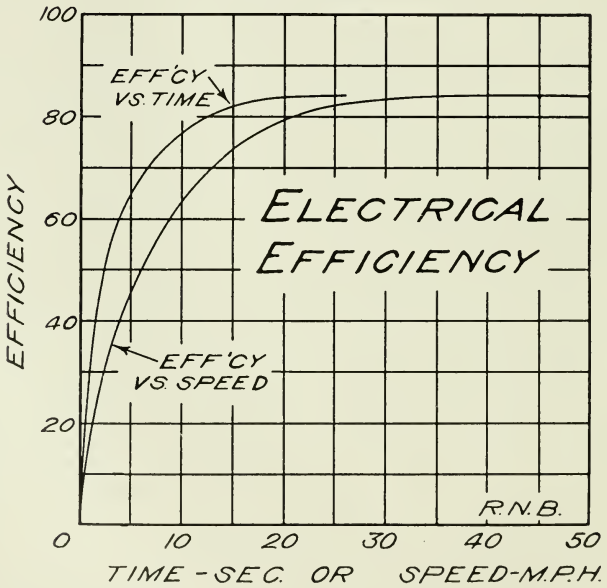


FIGURE 2.

Advantages of Electric Drive

From the standpoint of the passenger, the main virtue of the drive is its absolute smoothness. To speed up the bus, the operator has merely to depress the accelerator pedal. He does not have to manipulate a clutch or a gear shift, and there is no possibility of the discomfort resulting from improper operation of these controls. Also, as there is no time lost in changing gears, the bus is able to accelerate at a higher rate than a mechanically driven bus, up to a speed of around 35 m.p.h.

In a bus with mechanical transmission, the engine should be in the front portion of the bus, so that the operator can roughly gauge its speed by ear, to enable him to change gears at the proper moment. It is desirable, however, to have the engine at the rear of the bus, to cut down on noise and to reduce the possibility of fumes leaking into the passenger compartment. Hence it is seen that electric transmission must be used with rear engine mounting.

As mentioned above, the engine and generator are coupled together. The generator bell housing is bolted directly to the engine crankcase. The power output from this unit is all removed as electrical energy in flexible cables. Hence, as there is no torque output from the assembly, no torque arms are necessary, and mounting is considerably simplified. In practice there are three rubber-cushioned mountings, one at the front of the engine, and one on either side of the generator. These are so located so that the plane containing them passes through the centre of gravity of the assembly. In this way, the generator-engine assembly is free to vibrate torsionally, and none of these vibrations will be transmitted to the frame. This is of particular importance in the case of diesel engines, where vibration is high because of the high compression pressure.

As mentioned above, there can be no shock loading of the chassis or transmission parts, so maintenance costs on these portions of the bus are much lower than in the case of a mechanically driven bus. There is no clutch, which is always a source of trouble and expense in a gear-driven bus. It might be thought that considerable trouble would be had with the brushes and commutators of the direct current machines, but the art of electrical design has improved to the point where these parts can be made quite reliable, and in practice very little trouble is experienced.

While the engine is delivering power, it is operating at an almost constant speed in the vicinity of 1800 r.p.m. Therefore, the engine

may be designed and adjusted to give a higher efficiency at this speed, than if it was required to give a flat efficiency curve over a wide speed range, as needed for mechanical transmission. In the garage it is possible to get a very quick check on the operation of the engine. The power switch is placed in the neutral position, and the generator is loaded with a water rheostat. The power output can be quickly calculated from the reading of a wattmeter connected in the rheostat circuit. This is a distinct advantage, as otherwise the engine would have to be removed and taken to the testing bench for periodic checking. The efficiency of the drive, from the generator input to the motor output, is shown in Fig. 2. From the curve of efficiency on a base of bus speed it is seen that the efficiency is quite high above a speed of 10 or 15 m.p.h. This is shown more strikingly in the second curve, which shows the drive efficiency on a base of time. In drawing this it was assumed that the bus accelerated from rest at its maximum rate. Here it is seen that in the short time of five seconds after starting from rest, the bus is already operating in the high efficiency portion of the curve. This is of great importance in short trip city bus operation, where the bus must be accelerated many times every hour.

On the other hand, the gears used in a mechanical transmission would have an efficiency in the vicinity of 92%, while the maximum efficiency of the electric transmission is only 84%. This would mean that the mechanically driven bus could accelerate more quickly, except for the loss of time in changing gears. However, because this loss of time more than compensates for the higher efficiency, a speed of 35 m.p.h. can be more quickly reached in a bus with electric transmission, other things being equal.

As the operator of a diesel-electric bus has only an accelerator pedal to operate, he is able to devote more time to collecting fares from the passengers and to watching the traffic ahead. Therefore he is able to give more courteous, safer service to the passengers, making for goodwill between his company and their patrons. The exceedingly smooth and quiet operation of the bus also promotes goodwill.

Disadvantages of the Drive

The first cost of the drive is considerably higher than that of the equivalent gear transmission. However, one of the largest manufacturers of electric drives for motor-buses in the United States has found that the savings obtained by the use of electric drive amount to about 70% of the increased investment on the

drive per annum. As mentioned above, the drive is less efficient than gear transmission, but the higher acceleration more than compensates for this. The drive weighs considerably more than the gears and gear box that would otherwise be used. However, this is partially offset by the elimination of the engine flywheel. The generator armature has been found to have sufficient rotational inertia to perform the function of a flywheel.

Conclusions

Electric drive is preferable to mechanical drive for short trip city work in heavy traffic. While the efficiency of the drive is somewhat lower, this is more than compensated for by the economical advantages of higher acceleration, lower maintenance, and smoother operation.

No mention of hydraulic transmission has been made above. This type of drive seems to have definite possibilities for bus propulsion, but at the present time very few buses are equipped with hydraulic transmission on this continent. Over three thousand electric drives have been manufactured during the last ten years for use on this continent, and most of these are still in service. Until hydraulic transmissions can be made reliable enough and efficient enough to equal this record, electric transmission will continue to hold its present popularity.

Call to Arms. Election Day.

The 1923 Engineering Alumni Bursary

The Graduate Class of 1923 has kindly presented the 1923 Engineering Alumni Bursary to the Faculty of Applied Science and Engineering. To these men we owe many thanks for the interest they show in giving us this opportunity to advance our scholastic and "all round" ability.

The Graduate Class of 1923 of the Faculty of Applied Science and Engineering has presented the 1923 Engineering Alumni Bursary, having the value of One Hundred and Fifty Dollars annually, commencing 1939. This bursary is awarded annually to a student completing the Second or the Third Year; it may be awarded two years in succession to the same student, but will usually be awarded at the end of the Second Year. The award is made by a Committee of the Class of 1923, on the following basis:

(a) In addition to mental capacity, the student must show leadership ability and give promise, through his activities, of becoming a worth-while influence in the affairs of the profession and the community.

(b) While attention is given to scholastic ability, as evidenced by his academic standing, it is not the governing factor. He must, however, stand in the top quarter of his class.

(c) Special consideration is given to financial need.

Payment is made in three instalments following registration in the next year.

Information may be obtained from the General Secretary, University Alumni Federation, 43 St. George Street.

Fair Immigrants to Engineering

Professor H. E. Haultain

Last year Professor H. E. T. Haultain brought to an end his work as Professor of Mining Engineering after thirty years of teaching, guiding and moulding the characters of his boys at the University here.

His career and experience have been wide and varied. As an undergraduate he was the first president of the Engineering Society here at School. After graduation he worked in such places as Bohemia, British Columbia and Ontario.

After many wanderings and holding of responsible positions, Professor Haultain finally returned to his Alma Mater to devote his time to teaching. In addition to carrying out his duties in training young men for their engineering professions, he also took a deep interest in the students themselves. The Engineering Society, the summer work of the students, their hobbies and outside interests, their clubs and societies, their problems and difficulties, all were keenly followed and helped whenever possible. To Professor Haultain must go much credit for the *esprit de corps* and loyalty which our graduates and undergraduates feel for the old School.

His fame as a world authority on milling and as a research worker is known all over. Recently he was awarded the Randolph Bruce Gold Medal for outstanding contributions to the art of milling ores,

one of the highest honours conferred by the Canadian Institute of Mining and Metallurgy. Then there is his Infrasizer, his Superpanner, his works on milling and crushing, his many services of which only his intimate friends know. But his "boys" do not think of these so much when they think of the "Old Man," as he is affectionately known.

Rather we look up to him as a man whose philosophy of life, whose teaching of the long term and short term outlook, whose deep interest in the students, whose sense of humour and quick wit has given us something we shall carry with us through life.

There is something here which words alone cannot express, but can only be felt by those who know and have come in contact with him. And so, we salute you, Sir, and sincerely wish you success and happiness for many years to come.

Election Day

Our New Professors

The Faculty of Applied Science and Engineering has been very fortunate this last year in securing the services of Professor C. G. Williams of the Department of Mining Engineering, Professor G. F. Tracy of the Department of Electrical Engineering, and Professor R. F. Leggett of the Department of Civil Engineering.

These men have enviable records behind them and the recognition accorded them by their professions and various seats of learning are of the highest. We are indeed proud to think of these men as part of School, and only hope they have found us as agreeable and pleasant as we have found them.

* * *

PROFESSOR R. F. LEGGETT

Professor R. F. Leggett was born in England and educated there. He obtained the degree of Bachelor of Engineering, 1925, and Master of Engineering, 1927, from the University of Liverpool.

He became as Associate Member of the Institution of Civil Engineers, 1930; the Institution of Water Engineers, 1930; the Engineering Institution of Canada, 1931; the American Society of Civil Engineers, 1938.

From 1925 to 1928 he was engaged as a consulting civil engineer for Hydro-Electric schemes in Europe, the chief of which was the Lochaber Water Power scheme in Scotland, which included the building of the largest water tunnel in the world (15 miles long, 15.5 feet diameter).

From 1929 to 1932 he was associated with the Power Corporation of Canada and was resident engineer on the construction of the Upper Notch H. E. plant, the largest automatic plant in Canada. Seventy-five per cent of the concrete of this job was placed during sub-zero weather. It also included a 33 mile 110 K.V. transmission line.

His awards include the James Prescott Joule medallist, James Forrest medallist, and Miller prizeman of the Institution of Civil Engineers, the Telford premium by the Institution, and the Society's premium of the Liverpool Engineering Society, 1931.

From 1932 to 1936 he was an engineer in the Canadian Sheet Piling Company, Limited, Montreal.

From 1936 to 1938 he was lecturer in the Department of Civil Engineering at Queen's University, Kingston, Ontario.

In the fall of 1938 he became Assistant Professor of Civil Engineering at the University of Toronto. He is married and lives at 244 Glenrose Avenue.

* * *

Professor G. F. Tracy, B.A.Sc., M.S. (M.I.T.).

Professor G. F. Tracy was born and educated in Toronto. He came to University originally with the Class of '18 but spent three years overseas and returned to graduate in '21 in Electrical Engineering. He spent three years here as a research assistant to Professor Price, on Speed and Frequency Control.

He obtained his Master's degree from M.I.T. in '25. From M.I.T. he went to the University of Wisconsin, where he became a member of the staff of Electrical Engineering until 1938 when he was reclaimed by Toronto as Associate Professor of Electricity.

Many of his summers were spent in the electrical design department of the Allis-Chalmers Manufacturing Company. He has written at least two technical articles to the *Electrical Engineering Journal.*

He is associate member of the A.I.E.E., member of S.P.E.E. His fraternity is Sigma Psi with the honorary electrical fraternities of Tau Beta Pi and Kappa Eta Kappa.

He is married, has two children, and lives at 460 St. Clements Avenue. Among his hobbies music ranks foremost.

* * *

Professor C. G. Williams.

Gentlemen, may we introduce C. G. Williams, new Professor of Mining Engineering. Professor Williams has had a very busy and successful professional and executive career since he graduated in Mining Engineering with honours from School in the Class of '05.

During the summer vacations he worked in the Mill at the Craigmont Corundum Mine, land surveying in Saskatchewan and underground in the Calumet and Hecla Mine, Michigan.

Following graduation he was engaged for two years in the pulp and paper industry. He then went to Cobalt and was successively engaged at the Buffalo Mine, superintendent at the Otesse, Elk Lake, examining engineer at the Buffalo Mine, superintendent at the Nova Scotia Mine, Cobalt. In 1911 he was appointed general manager of the Diester Machine Company, Fort Wayne, Indiana, but in 1912 he returned to the Buffalo Mine as examining engineer.

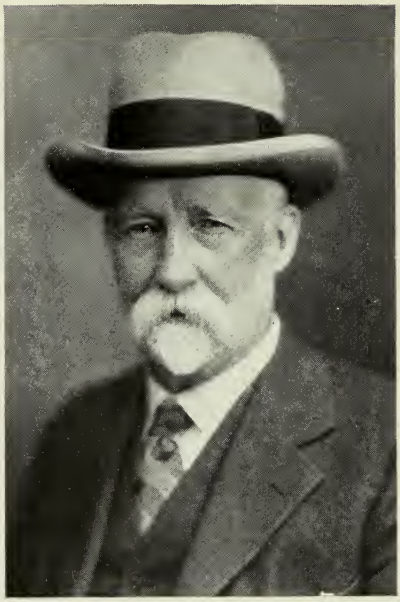
Professor Williams was with Hollinger Consolidated Gold Mines from 1913 to 1928, holding positions successively as mill draughtsman, construction superintendent, development superintendent, refiner, mill superintendent, mine and mill superintendent, and for the final twelve years, general superintendent. He left the Hollinger organization in 1927 to engage in private consulting practice. From 1934 to 1936 he was selected for the position of general secretary of the Canadian Metal Mining Association. This position he relinquished in 1936 for general consulting practice.

Professor Williams has been a member of the Canadian Institute of Mining and Metallurgy since 1908, and was vice-president, representing the Province of Ontario, from 1928-29. He has held office as the vice-president and president of the Association of Professional Engineers of Ontario and as a director of the Engineers' Club of Toronto.

With such a background of experience, the department he is now directing is in very capable hands. In the short year Professor Williams has been with us, our high optimism has been more than justified and we heartily wish him many years of success at his new post.

A Tight Spot

Professor Coleman



Professor Arthur Philemon Coleman, Ph.D., D.Sc., LL.D., F.R.S.C., F.R.S., the oldest living member of the staff of what was formerly the School of Practical Science, passed away on February 26, 1939. Few of the present generation of students and probably not many of the younger members of the staff of the Faculty of Applied Science and Engineering, realize that Dr. Coleman, so noted as a geologist, was for ten years Professor of Assaying and Metallurgy in the School. He showed great versatility in his interests and talents. In addition to being one of the leading geologists of the world, he was one of the most popular writers and lecturers on science in Canada, and he was also a fine artist. The large paintings of glacial features in the Royal Ontario Museum of Geology were painted and donated by him. He painted hundreds of pictures of scenes in all parts of the world.

Professor Coleman was born at Lachute, Quebec, on April 4, 1852, so at the time of his death he was in his eighty-seventh year. So active was he until the end of his career, that many young men found it difficult to keep up with him in the field and few could follow him up the mountains. In reply to a question of a member

of the staff, when he was eighty-five years old, as to whether his age handicapped him seriously, he said "Yes, I do not think I could climb a mountain over fifteen thousand feet in height or make a rough trip of five miles without some help in transporting my pack". After he was over eighty, he spent two of our winters in the high sections of the Andes in Colombia, one among the high mountains of southern Mexico and two in Central America. These expeditions were for the purpose of studying any evidence of glaciation in the tropical regions during the Pleistocene epoch. All his actions were characterized by remarkable energy and by sincerity in the search for knowledge and truth as revealed by natural phenomena.

In 1876, Dr. Coleman graduated from Victoria University at Cobourg, Ontario, and he received the Ph.D. degree from the University of Breslau, Germany in 1881. The following year, he was appointed Professor of Natural History in Victoria and he held that position for ten years. Victoria joined the federated colleges of the University and moved to Toronto. Professor Chapman was Professor of Geology and Mineralogy, and Coleman was appointed, in 1891, Professor of Assaying and Metallurgy, and held that position until 1901, when he was made Professor of Geology in the University. This position he held until 1922, when, at seventy years of age, he retired with the title of Professor Emeritus. He was Dean of the Faculty of Arts from 1919 to 1922, and from 1914 to his retirement, Director of the Royal Ontario Museum of Geology. He lectured to the Engineering students throughout his long connection with this institution, and he was a very popular lecturer because of his fine personality, enthusiasm and energy.

Dr. Coleman played a very important part in the exploratory and geological work in this province and in many other parts of Canada, especially in the early days of the mining industry. He wrote many reports for the Ontario Bureau of Mines between 1893 and 1909 on gold and iron deposits, and he was a recognized authority on the Precambrian formations. His most outstanding economic work was on the Sudbury nickel field, which appeared in 1905. He revised the results of his studies of this famous field in 1913, when the Mines Branch published his very valuable report, "The Nickel Industry, With Special Reference to the Sudbury Region." This was accompanied by the splendid map that is so well known and has been distributed nearly all over the world.

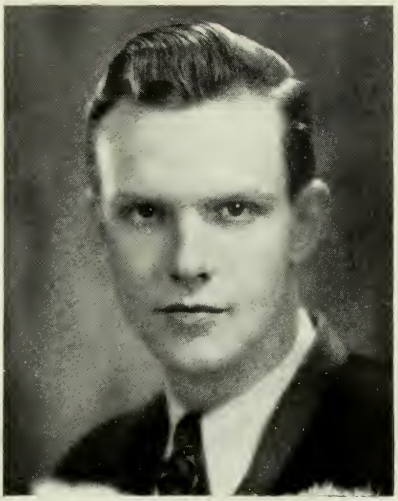
Turning from Precambrian and economic geology, Coleman directed his studies to glacial geology, and became the world's leading glaciologist. He visited practically all known glacial

deposits in the world, and his collection of tillites, ranging from Precambrian to Pleistocene, gathered from every continent, now in the Royal Ontario Museum of Geology, is the finest in existence. He published a book, "Ice Ages, Recent and Ancient", and prepared a manuscript on the Pleistocene for another book, that at the time of his death had not been published. It is hoped that this may be given to the public in the near future. He also published several reports on the glacial geology of southern Ontario, the most important being that on the Pleistocene of the Toronto Region, for the Ontario Department of Mines.

Professor Coleman received many honours; the Murchison Medal from the Geological Society of London and the Flavelle Medal of the Royal Society of Canada, Fellowship in the Royal Society of London, the honorary degree of Doctor of Science from the Univeristy of Toronto and the University of Adelaide, the degree of Doctor of Laws from Queen's and Western, and the Penrose Medal from the Geological Society of America, the highest honour in the gift of American geologists. He was president of the Royal Canadian Institute, the Royal Society of Canada and the Geological Society of America. With all his honours, his manner was simple and unassuming, and his charming personality made him one of the most respected and beloved scientists that Canada has produced.

E. S. Moore.

Bob Dyer



Robert K. Dyer, son of Professor Frederick C. Dyer and a Fourth Year student in Mining Engineering, passed away on January 30th, 1939, as a result of a peculiar case of blood poisoning. Twenty-five blood transfusions given by Bob's two brothers and classmates, and the interest of Toronto's eminent specialists failed to save his life.

Bob, only twenty-three years old, worked in the gold mines near Rouyn, Quebec, the last two summers. Formerly from Hillcrest Public School and North Toronto Collegiate, he gave up most of his spare moments to his duty as an executive officer for the Young People's Society of St. Columba United Church.

His high ideals and sterling character along with his intelligence and generosity will long be remembered and admired by his many friends.

School House

YEAR BOOK
1939

ENGINEERING SOCIETY

THE UNIVERSITY OF TORONTO

J.F. FORD
PRES. ATHLETIC ASSOCIATION

S.M. DUNN
TREASURER

A.A. McARTHUR
1ST VICE-PRESIDENT

P.C. ANDERSON
PRESIDENT

G.P. DEWAR
2ND VICE-PRESIDENT

G.F. KELK
SECRETARY

J.C. ANDERSON
DIRECTOR OF PUBLICATIONS AND PUBLICITY

E.H. HYMMEN
CHAIRMAN
ARCHITECTURAL CLUB

C.D. DICK
PRESIDENT 4TH. YEAR

F.F. WALSH
PRESIDENT 3RD YEAR

ENGINEERING SOCIETY EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

ASHLEY AND CRIPPEN
TORONTO

H. COONS
PRESIDENT 2ND YEAR

G. HUDDLESTON
PRESIDENT 1ST. YEAR

H. GREEN
CHAIRMAN
CHEMICAL CLUB

R.A. RULE
CHAIRMAN
CIVIL CLUB

H. DE V. PARTRIDGE
CHAIRMAN
DEBATES CLUB

W.W. RAPSEY
CHAIRMAN
ELECTRICAL CLUB

L.B. WALKER
CHAIRMAN
MECHANICAL CLUB

W. ATKINSON
CHAIRMAN
M. & M. CLUB

J.L. ORR
CHAIRMAN
ENG. PHYSICS CLUB

Engineering Society Elections, 1939

ENGINEERING SOCIETY EXECUTIVE

President.....S. M. S. Dunn
1st Vice-President.....D. Turner
2nd Vice-President.....G. F. Kelk
Secretary.....J. Leitch
Treasurer.....W. Brown

ATHLETIC ASSOCIATION EXECUTIVE

President.....G. M. McHenry
Vice-President.....J. Buchan
Secretary-Treasurer.....F. Dobson

EXECUTIVE 4T0

President.....D. R. B. McArthur
Vice-President.....J. D. Bryce
Secretary-Treasurer.....Y. H. Williamson
Athletic Representative.....D. C. Jennings

EXECUTIVE 4T1

President.....B. Davis
Vice-President.....S. Munro
Secretary-Treasurer.....A. L. MacLean
Athletic Representative.....R. W. Fugler

EXECUTIVE 4T2

President.....B. O. Dick
Vice-President.....M. D. Boyd
Secretary-Treasurer.....W. F. Brundrit
Athletic Representative.....L. Doherty

CLUB CHAIRMEN

Architectural.....B. Tedman
Chemical.....G. Kennedy
Civil.....K. Clawson
Electrical.....D. E. McGregor
Engineering Physics.....H. Stark
Mechanical.....L. A. Patterson
Debating.....R. Greig
Mining and Metallurgical.....F. Bolton

PERMANENT EXECUTIVE — 3T9

President.....A. A. McArthur
Vice-Presidents.....P. C. Anderson
R. A. Rule
Secretary-Treasurer.....F. C. Read
Councillors.....J. C. Anderson
A. H. Kingsmill
R. Boyd
A. Glazer
F. Meschino
J. Orr
H. Green
L. Train
Bronze "S".....R. Galway

Impressions of School

Cross Section of School Opinions

Ian McCallum, 4T2

Today, as I approach the end of my first year, it hardly seems possible that so much has happened in such a short space of time since I left my happy hearth to become a forgotten man in S.P.S. No matter how I look at it, the impression still remains that I am a forgotten man. All freshmen are forgotten men. A broad statement, but undoubtedly we will grow up some day. We were told we are worms, yet to behave like men; to do our own thinking, yet to use our own methods; to quench our thirst with forty beers, yet uphold the honour of School.

My infantile idea of an engineer, before I was so fortunate as to be enrolled as one myself, was of a man clad in hip boots, breeches, and dirty shirt, striding through the wilderness with a transit over one shoulder and a pick-axe over the other with a tape trailing behind. But a sad disillusionment awaited me. On my very first day I was told to be a gentleman at all times, while outside "Sophs" prepared a tapping tub. I was told to be neat, concise, to the point, and the romantic hero of my dreams faded in the afterglow.

My future hopes mean very little. Many who graduate in a given course certainly do not find jobs in their chosen field. Not committing myself, I can quote the ancient maxim, " 'Twixt cup and lip, there's quite a way". I can only hope.

My year, discounting my scholastic effort which has yet to show results, has been a complete success. I have dipped into the bottomless pit of knowledge, and I have not come out empty handed. I have met many people whom I regard as friends. I have been taught about friendships, loyalty, and that very badly misnamed emotion—School spirit—which has woven itself around me from the first day.

The time left this year is short, as the finals close in. The final grind has already started. As I gaze into the fire, my pipe dreams disappear with smoke. One thought alone comes to my mind—"Stupid fellow—get to your books."

I have still a hope. A blind pig sometimes finds an acorn and I might be able to answer a question or three on the final papers. My fate lies in the laps of the gods and hangs by the slender thread, the sense of humour of the staff. May they remember their freshman year!

Pete McCurdy, 4T1;

Putting away the shovels in the north, we headed south to the Little Red School House. On the way we took a gander at U.C. steps to give the new "crop" the once-over—well, by now, everyone has their own opinion about them.

The first thing to be attended to was the "Frosh". One by one they wheeled out—we rolled up their pants, and so on; suddenly pants turned into skirts! What were we to do in the form of initiation besides find out names and telephone numbers?—which, I may add, several people found quite handy. So a problem for 4T2 is to find some way for School to proudly exhibit 4T3 freshettes.

No sooner had the feud between Sophs and Frosh ended than another battle began, and that was none other than S.P.S. vs. Sadie Hawkins. Many a Schoolman will remember that week for the rest of their life. Next year some scheme should be arranged to give better batting average of successful Sadies (i.e., from our point of view), such as double dating rather than blind dating.

We all feel very sorry for the Dean as he found his lectures rather dull this year, only being able to address "gentlemen". Better luck next year!

The "Do's", such as the School At-Home, School Nite, were better than ever this year; at least we thought so—perhaps it's because we had learnt how to really appreciate them (i.e., who and what to take to which and why).

Rugby dances, hockey, lacrosse, swimming, basketball, debating, and so on—all were more than represented by Second Year. If you don't believe me, or hadn't realized it, take a squint through this book. See! it's true! So we of 4T1 are really great "balls of fire"!

Here's hoping that all of us will be "permitted" to do five or six lab reports per week next year—we will kick about it later, I hope, I hope.

Jeep Dewar, 4T0:

Despite the favourite cry that third year is designed to kill or cure, this year has been the gayest of all three. The Soph-Frosh and School Nite were, as usual, the best mass production shambles of the season, with the year parties coming a close second. School At-Home this year was a honey and certainly goes down in history as the best party yet. Never at any one dance have I seen so many Schoolmen thoroughly enjoying themselves, swinging out to both sweet and hot music.

BURNING THE MIDNIGHT OIL

By M. McMurray

We can all remember coming to School with our great respect for professors and for Third and Fourth Year men. Now here we are in Third Year still with our great respect for the profs, especially in these months of stress, but we really aren't much older, and I can't help wondering if the present First Year stands in awe of us because if they do they are suckers. We have learned a few things, however, and developed a much broader and sounder outlook; not so much from labs and lectures as from informal discussions with the profs when they let their hair down, and from the bull-sessions held regularly in the Grads every afternoon. We have lost our self consciousness, most of our rowdyness and, thank the Lord, the bad habit of taking ourselves too seriously. Unfortunately, we have lost all desire to work, too, but with spring ploughing only a month away we just have to start studying tomorrow or at the latest, next Monday night.

Good old 4T0 has more than done its bit for the University and School, with nearly every member of the year contributing in some way to the athletic and social events. We are all looking forward to Fourth Year and the "do" we have been promising ourselves if we could ever get that far. I just heard that the year fund is over four hundred dollars, so start counting on the greatest Grad Ball ever thrown.

Jack Miller, 3T9

If you think those long faces are due to the exams creeping up on the innocent of 3T9, you are mistaken. Faced by the prospect of working for a living, we, the most enlightened of Schoolmen, look with awe at the end of April. Some, with a forced smile, proclaim their gladness at being done once and for all with the examination room; but it is with a heavy heart we forego our game of wits with the profs; from the time we successfully crept in the back of C26 at 9.30 to the time we no longer deemed lectures an essential part of education, we have been on the winning side.

Taking time out to look over those activities we enjoyed before gloom encamped upon our persons, we remember that memorable Christmas party at the Boulevard Club. Finding the dance hall virgin, your observer betook himself to the bowling alley via the "pub", and, arriving there some two hours later, beheld many strange sights. The party was a bowling success.

By cutting down meals to one every so often, rolling our own and putting the bite on unsuspecting Art's men, we managed to

take in the School Dinner, a marvellous At-Home, and even endured the "prudish" atmosphere of School Nite.

And now turning our thoughts to the future, we think of—our Thesis? No! The Graduation Ball? Of course! We hope no one pours us down that fire escape again.

Although still incomplete masters of a few minor formulae, we are proud to say that in the soothing atmosphere of the Park Plaza we have solved many of the world problems. We can think of no better place to solve them. With this advice to those who follow, we look for new worlds to conquer.

Our President

"What'll I Do Now"

Most of us, at some time or another, get the itch to do something which lies beyond the pale of mundane, day-to-day responsibilities; something which holds an absorbing interest for us, yet does not make excessive demands on time which must be spent at less interesting but perhaps, at the moment, more important activities. These pursuits, or hobbies, may yield us no more than a carefree hour now and again, or they may lead to thrilling experiences culminating in unexpected discoveries and the opening up of a new mode of life. From just such small beginnings have great industries arisen, and great inventions been uncovered.

Schoolmen apparently realize the wealth of fun and opportunities to be found in a hobby, for many and varied are the extra-curricular activities at which they spend of their time and money. These range from making collections (and the stuff you can collect!) to building and operating complete radio transmitters and receivers.

There are several "Collection Agencies" at School, perhaps one of the more interesting being the "Hot Record Collection Society". Doug. Gray I, who (fortunately, we think) lives in Port Credit, has been accumulating torrid "canned" music for over four years, and has on tap some 200 recordings by Benny Goodman, Artie Shaw, Bob Crosby and the boys. His family, no doubt, has heavy insurance on the house, in anticipation of the day when it becomes vibrated to pieces. Other members of the swing fraternity are Clark Muirhead and Tom Pearce, both in First Year. The former became so addicted to the pulsations of the bass that he formed his own orchestra and nearly drove his folks into voluntary retirement at 999. He decided to try photography then, and claims it is more soothing, but still collects records "just to keep in the swing of things."

To cite another example of the collector type of hobbyist, a chap in Third Year has a tree fungus from each portage he crossed in the course of a two-weeks canoe trip a few summers ago. Recorded on each is the name of the portage and the date. Makes a picturesque but rather cumbersome diary, and, as he said, by the end of the trip there was no room in his pack for food, so on subsequent trips he confined his collecting to fish, which are not carried on, but in.

Which reminds me of gasoline motors, and that Joe Brown, Third Year, has a passion for listening to the silent, silky purr of a

smooth model T engine. A couple of years ago he bought one of those venerable, animated ash-cans, painted it black, and in large pink letters inscribed on the side "Toronto to Mexico City (We Hope)." He got there, too, 'though of course there were trivial delays—more than once, as he was pumping up one corner another was subsiding, and one day he was lucky enough to have only twelve flats. He practically wore out what there was of a motor by taking it apart to see why it wouldn't tick. This was his second jallopy and almost cured him, but now he feels almost strong enough again to try another—so keep your shiny new LaSalles off the roads this summer.

"Ham" may mean only cooked pig to some of you, but to thousands of people it means a friendly voice from out of space, dropping in to have a chat or to relay some message, for a Ham is an amateur radio operator. This hobby is becoming increasingly popular at Varsity, there being about twenty-five Hams on the campus, most of whom are in School. Last spring a club was formed under the leadership of Professor Lazier, and this year, having drawn up a constitution, it is going ahead to further the development of amateur short-wave transmission at the University.

There are two schools of thought among Hams as to the most enjoyable method of sending and receiving messages. One prefers voice or 'phone, while the other chooses the dit-dah of code. In any case a Ham must work in code for at least two years before he may use 'phone. This is one of the very strict government regulations as set forth by the Department of Transport, which controls short wave. Another concerns two items of equipment

Some Schoolmen's Hobbies

every Ham must own: first, a frequency meter, which keeps the set tuned to its own wave-band; and secondly a monitor which is used as a check on the call signal, to see that it is kept strong and clear.

Among the most active Hams in School are the McArthur brothers, Sandy and Jock, each of whom is a licensed operator having his own call letters. They have been transmitting since 1932 over their 75-watt set, and have made many interesting acquaintances in spots as remote as New Zealand and Australia, often arranging a regular schedule of calls. They prefer to work in code since it is the international means of communication, and since most operators prefer it.

Other active Hams include George Cates, Vic. Mason, Walt. Ward, Lee Foster, Don McGregor, Jim Cline, and several others, most of whom have joined the Varsity Radio Club.

The cost of a station varies with the individual, but from $50 to $200 should set you up in the business. Government receivers are constantly tuned in and are quick to reprimand any breaches of the rules and regulations.

Stories of the part played by Hams in times of distress and flood are always most interesting, but as Lake Ontario doesn't wash the place off very often, the local Hams haven't a great deal of experience in dealing with tricky situations like that. In case you'd like to know what those call letters mean, for example Sandy McArthur's call of VE3XK, the first two letters stand for "Canada," the 3 for "Ontario," and the last two are the personal call. Most Hams build their own sets and thus get a double kick out of amateur radio. It is a fascinating and very popular hobby and it is not hard to understand the appeal it has to those who are interested in events in the far corners of the world.

You may have read in the daily papers a while ago of a chap who built a complete electric organ. That chap was Dick Scott, of Second Year, and surely his hobby must be unique among the men of School. While at Jarvis Collegiate, Dick became interested in the mysteries of electricity, and created a model theatre having all the equipment to be found back-stage in a modern play-house. With its aid, lighting effects could be studied in miniature and then applied to actual productions at the school. Jarvis is still using Dick's contribution to Secondary School posterity, and isn't likely to forget him for a while, especially if he comes up with any more creations like his organ. For over five years he spent his spare time practically inventing and making this masterpiece,

for he never studied other organs, used no plans, and made the hundreds of intricately fitted parts by hand. His discouragements were many and disheartening, but he doggedly persevered and today has a 200-pipe organ, of which any man could justly be proud.

The usual action for so-called electric organs is only semi-electric, motors starting the opening of the valves and compressed air doing the rest. Dick's action is electric throughout, using magnetism to open the valves directly.

The only parts he didn't build up from the raw materials are the keyboard and the motors. Take a look at an organ some time and see how much he really did build. He painted the show pipes with aluminum paint, and the resulting picture was so impressive that the Aluminum Paint Co. of America is using it in its advertising.

After completing it, Dick had to learn to play it, and did, without lessons, which is the finishing touch to a tough job, well done.

R.C.Y.C. have long been letters of distinction wherever the sailing fraternity gathers. Since there are no 40-ft. floating palaces under the command of present-day Schoolmen, it is a good bet that Blake Tedman's racing dinghy is the trimmest little craft to have a skipper who attends these sacred halls of learning. Blake has been getting his pants wet over the low side for six or seven years now, and for the past two has been flying the colours of the R.C.Y.C. He was a member of the team sent by Varsity to compete against McGill, Queen's and R.M.C. for the inter-collegiate title which Varsity won a year ago. Last year, in Boston, he and his crew, Jim Easson, of First Year, placed 6th in a field of 30 which included teams from most of the great eastern American colleges—a feat of which they are both justifiably proud.

Doug. Knowles, First, and Ken Clawson and Bill Grier, Third, are other sailor-laddies in School. Doug. was also sailing at Boston last year, while Ken and Bill bought a second-hand dinghy, rebuilt it, and proudly took it to Survey Camp. If that boat would only talk!

Let's get up off the ground and out of the water now and take a hop with the Schoolmen with wings. Flying has always been among men's most thrilling endeavours, and there are several in School who like to get above the rest of us once in a while. Bill Burgess and Ernie Robertson are two of our more experienced pilots, Bill having about 130 flying hours and Ernie close to 150.

Bill has been flying for over four years now and likes it better each time up. His first flight, across the English Channel in 1929, may have roused his interest in aviation, for he now has his private license, and is looking with appraising eyes at the development of the T.C.A., for, lurking in the back of his mind is the idea that some day he might like to try transport piloting. His interest is also attracted to underground, where he expects to make his living—the next thing we know he'll be navigating submaries.

Ernie Robertson has also had quite a career in the air. He learned to fly in England when he joined the R.A.F. Reserves. Here he received six weeks' intensive training under Royal Air Force supervision. On coming to Canada he joined No. 110 Squadron of the Auxiliary Air Force of the R.C.A.F. at Camp Borden, and has been continuing his training ever since.

Tom Jull, of First Year, has not spent as many hours in the air as the others, but he certainly gets as big a thrill out of the game. He learned to fly by hanging around the airport after school and going up when he could, eventually taking his first solo without a license and without his parent's permission in 1937. Later that same year he passed his flying test and exam on air regulations, etc., thus finally earning his license.

All these fliers claim their biggest thrill came at the time of the first solo flight and they all agree that it's not so hard to get up, but landing again is a horse of a different odour.

Then there is the Third Year man whose hobby is practicing beer guzzling so that he can down a stein for each year of his life on every birthday. I saw him on his 27th,—and he did it, so help me, and with two to spare; then, like a liner quietly slipping down the ways at launching, he gently slid, with a last gassy gurgle, underneath the table.

PROF. C.R. YOUNG
HON. VICE-CHAIRMAN

W. STORRIE
HON. CHAIRMAN

R.A. RULE
CHAIRMAN

PROF. W.M. TREADGOLD
HON. VICE-CHAIRMAN

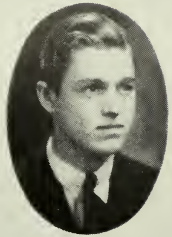
S.J. SIMONS
VICE-CHAIRMAN

CIVIL CLUB EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

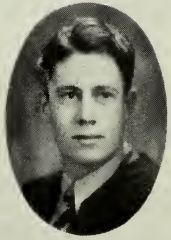


J. STIRLING
SEC.-TREAS.

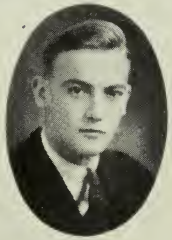
M. HOWE
4TH. YEAR REP.

J. MOORE
3RD. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO



W.D. RAMORE
2ND. YEAR REP.



J. LEITCH
1ST. YEAR REP.

FOURTH YEAR CIVIL

Left to Right:
Back Row: G. C. Powell, W. H. Powell, R. C. A. Waddell, J. C. Anderson, W. Laari, W. P. Pigott..
Middle Row: M. W. J. Howe, E. E. Robertson, F. W. Philpot, D. D. Stiles, J. I. Thompson, J. H. Rogers, W. M. Walkinshaw, J. F. Ford.
Front Row: Prof. W. J. Smither, W. M. Hogg, Prof. C. R. Young, R. A. Rule, Prof. W. M.. Treadgold, Prof. T. R. Loudon, C. D. Dick.

Civil Club

The Civil Club has concluded another year's activity with pleasing success both in the social and educational realms. This success is due to the work of the executive, the co-operation of the members and the ever-helpful assistance of the staff who turned out to all our functions and made each of them more enjoyable.

Mr. William Storrie, consulting engineer from downtown, again favoured us by acting as our honorary chairman, and took a very keen interest in all the Club activities.

The success of any Club in School depends largely upon the support given it by the members in attending its meetings, luncheons or smokers. When a group of fellows of the type represented by our own undergraduates get together, a successful time is assured. The larger the attendance, the greater is the enjoyment for all. Hence, to those who came out to our affairs, our appreciation; to those who stayed away—our sympathies!

The new members, our freshmen, were initiated into the Club at our first meeting—a dinner at Hunt's on October 12th, 1938. Professor Treadgold gave us a very instructive and sincere address.

The annual trip for the Third and Fourth years was on October 14th, 1938, when the Ontario and Queenston Power plants were inspected.

The first smoker of the year was on Wednesday, November 30th, 1938. The speaker was one of our own graduates, Mr. J. M. Breen, of the Canada Cement Company, Ltd. He gave an extremely interesting talk on Cement and Concrete and showed us slides picturing the road construction programme in Germany.

An exuberant gang celebrated the Christmas exams, on January 5th, at the Royal York Supper Dance. This was held in conjunction with the M. & M. Club which seems to be now a customary yearly event.

Mr. W. C. Miller, City Engineer and Treasurer of St. Thomas, gave us an address on Municipal Administration at a luncheon in Hart House on Friday, January 27th, 1939.

At the present time, with School elections, and then the examinations not very far distant, plans are under way for our final get-together. May we take this opportunity of thanking the executive and the staff for their help and wishing each and all success in exams and in obtaining temporary or permanent jobs as the case may be.

R. A. Rule.

Mining and Metallurgical Club

This year has been a very eventful one for the Mining and Metallurgical Club.

Starting the year off we met with C. G. Williams, successor to H. E. T. Haultain, as Professor of Mining Engineering, and at this point the Executive would like to express their thanks to him for his sincere interest and helpful guidance to the Club.

We were very fortunate in having as our honorary chairmain Mr. J. Y. Murdoch, whose executive positions in the min,ng industry are too numerous to mention here. Our councillor, C. W. Drury of the Deloro Mining and Smelting Co. Ltd., has also taken a keen interest in the Club.

Our activities this year included a Smoker at which the Freshmen were introduced to the Club. The first dinner was held at Hart House on December 1st. Dr. Joliffe of the Department of Mines, Ottawa, gave an illustrated address on the North West Territories, with particular reference to the Yellowknife, Canada's new mining field.

The second dinner, held at the Military Institute was very outstanding. Mr. J. Y. Murdoch talked to the Club and left us much to think about.

At the time of writing, future activities are rather indefinite. We plan a student programme for the March meeting of the Toronto branch of the C.I.M.M.E. We also hope to hold another dinner.

During the year, the fourth year were the guests of the Orillia Manufacturers, and also took a trip through the Canada Wire and Cable Co. Plant at Leaside.

The Executive Committee wishes to thank everyone connected with the Club for their co-operation.

W. C. Atkinson.

PROF. G. A. GUESS
FACULTY SPONSOR

J. Y. MURDOCH
HON. CHAIRMAN

W. C. ATKINSON
CHAIRMAN

C. W. DRURY
COUNSELLOR

L. F. TRAIN
VICE-CHAIRMAN

W. L. COURTNEY
3RD. YEAR METALLURGISTS

F. S. BOLTON
SEC.-TREAS.

MINING AND METALLURGICAL CLUB EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

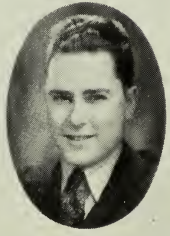
1938 1939

W. J. NICHOLS
4TH. YEAR MINERS

N. THOMPSON
3RD. YEAR MINERS

V. H. SMITH
1ST. YEAR MINERS

D. MILNER
2ND. YEAR MINERS



J. MAGOR
2ND. YEAR METALLURGISTS

J. H. TURNER
1ST. YEAR METALLURGISTS

ASHLEY AND CRIPPEN
TORONTO

Left to Right: MINERS, METALLURGISTS, AND MINING GEOLOGY

Fifth Row: J. B. Basset, W. J. Taylor, D. B. Campbell, D. S. Craig, G. S. Kabelin, W. A. Moore, R. L. Cavanagh, W. C. Atkinson, J. V. Newton, Mr. T. A. Frankish.

Fourth Row: C. D. Bushell, E. W. Watt, R. T. Wilson, A. D. Moore, P. F. Pullen, D. H. Mode, A. H. Kingsmill, W. W. Veal, Mr. R. H. Junker.

Third Row: J. Christo, J. A. Grosskurth, J. J. F. Smith, S. L. Lynn, H. P. Wilson, J. J. Sullivan, D. Ziff, J. G. Smith, M. McMurray.

Second Row: Mr. W. A. M. Hewer, W. V. Usatis, W. J H. Disher, F G. Cooke, M. R. MacPherson, W. J. Burgess, A. B. Chisholm, T. C. Keefer, A. K. Walton, Mr. W. T. Turrall.

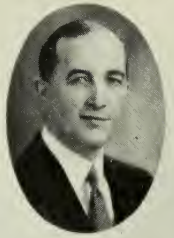
First Row: Dr. G. B. Langford, Mr. S. E. Wolfe, Dr. E. S. Moore, Prof. C. G. Williams, Miss J. Bradshaw, Prof. G. A. Guess, Prof. J. T. King, Prof. J. E. Toomer.

Absent: Prof. F. C. Dyer, Prof. J. A. Newcombe, G. B. Dewart, R. H. Galway, W. A. Pringle, W. J. Nicholls, R. L. Henderson, K. R. Wallace, C. W. Ness, L. F. Train, W. M. Sanson, C. E. Chesher.

PROF. R. W. ANGUS
HON. VICE-CHAIRMAN

L. B. WALKER
CHAIRMAN

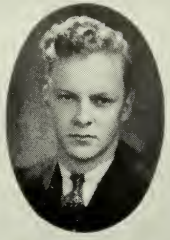
H. H. ANGUS
HON. CHAIRMAN



PROF. W. G. MCINTOSH
HON. VICE-CHAIRMAN

W. HOFFMAN
SECRETARY

MECHANICAL CLUB EXECUTIVE



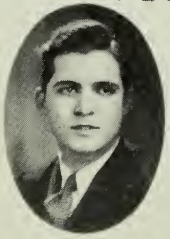
A. R. DAWSON
VICE-CHAIRMAN

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

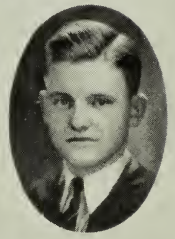
D. CLOSSON
4TH YEAR REP.



E. MYATT
3RD YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

W. BRYDON
2ND. YEAR REP.



J. FLEMING
1ST. YEAR REP.

MECHANICAL—FOURTH YEAR

Left to Right:

Left Top: M. Maher, B. Ballagh, J. Smith, F. Wooldridge, C. H. Phillips, J. D. Clarkson, G. Greason, A. Smith.

Second Row: P. B. Dilworth, G. Elms, C. Mudie, M. D. Stewart, H. G. Ronson, H. D. Dick, R. M. Boyd, H. Turley, W. Cowan.

Third Row: D. Closson, W. Boyd, R. C. Wiren, E. A. Allcut, R. W. Angus, R. Taylor, W. G. McIntosh, L. B. Walker.

Mechanical Club

With the appearance of TRANSACTIONS we can look back upon another successful year for the Mechanical Club, and no doubt many of the handsome gentlemen of the Fourth Year (who attract us to this page) have their misgivings as they do so. It is the end for them, or perhaps only the beginning, but may the rest of the Mechanicals carry on the traditions as before.

Early in the fall the Third and Fourth Year had enjoyable trips (educational? certainly!)—the Fourth Year to Queenston and to Buffalo, which gave them an opportunity to compare steam and water-power plants; and the Third Year to Hamilton, where they broadened their knowledge of steel production at the Steel Company of Canada, and of electrical equipment and manufacture at the Westinghouse Company. The First and Second Years had their trips early in January, when the Second Year visited the Canada Wire and Cable Company, Limited, and the First Year went to Canadian General Electric Company, Limited. We think they had a good time, too.

Several attractive Smokers were held. If the Smokers were fewer this year, they made up in quality what they lacked in quantity. At all of them we had refreshments of some sort, both mental and physical.

Some of the highlights were the visit of Mr. H. Thomasson, of Westinghouse, who told us more about welding than we have heard in many a day; Mr. Wilson and Mr. Pinder, of the Crane Company, came to Hart House on another occasion and showed us, with the aid of movies, the whole industrial processes of making valves and fittings; and among others notable was the exposure of the National Tube Company by Mr. E. Foy, who came from Montreal for the occasion, of the methods used to make seamless tubing from the mine to the hardware company.

By way of lighter entertainment we enjoyed a very informal post-exam dance in January at the Embassy Club, and did we need a reviver! Everybody had a good time, and it was inexpensive.

The wind-up of the year's activities was the annual Dinner in March, when Mr. Nagler, of the Allis-Chalmers Company, Limited, honoured us with an address entitled "Engineering in the Hobbies". We are sure he gave us much food for thought, while being an excellent entertainer at the same time.

Good luck to all on the exams, and cheerio!

LLOYD B. WALKER,
Chairman, Mechanical Club.

FIFTH YEAR ARCHITECTURE

Standing: W. E. Carswell, Prof. H. J. Burden, Prof. H. H. Madill, Col. M. Waters, Prof. E. R. Arthur.

Sitting: E. H. Hymmen, J. L. McFarland, A. B. Scott, C. E. Pratt, J. Sugarman, F. P. Meschino.

B.H.M. TEDMAN
VICE - CHAIRMAN

MR. GLADSTONE EVANS
HON. CHAIRMAN

E.H. HYMMEN
CHAIRMAN

E.H. NOAKES
SEC.-TREAS.

JACK SUGARMAN
5TH. YEAR REP.

ARCHITECTURAL CLUB EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

ASHLEY AND CRIPPEN
TORONTO

S.B. BARCLAY
3RD. YEAR REP.

L.A. ALLEN
2ND. YEAR REP.

J.A. MURRAY
1ST. YEAR REP.

Architectural Club

Leaving behind the dazzling beauty of Gull Lake, we were struck by a horse of another colour when we arrived at School. Imagine! four freshettes in one year! It was a bit of a shock, but quite a pleasant one. Their bright and cheery dispositions are very much appreciated. Now the boys don't have to walk through the rotunda of University College on their way home for lunch. From what we have seen we are quite sure that the stock of the department of Architecture has risen considerably.

In writing an article such as this, which amounts almost to an obituary, it is customary to pick out the highlights and elaborate on them. Most of our Club activities seem to be confined to the draughting room, where the motto appears to be "Never a dull moment".

The annual Dinner held this year in November at the Park Plaza Hotel was a definite success with Mr. Gladstone Evans as guest speaker. We were delighted to see so many graduates present.

But the highlight of the year has yet to be run off—the Mauvais Arts Ball. Ideas are flowing thicker than water and we have high hopes for a very successful party. Quite an appropriate theme has been chosen for the occasion—an underworld speak-easy.

And now with feeble hands I try to write a conclusion, but words fail me. May I wish you all the best of luck.

E. H. Hymmen,
Chairman.

Engineering Physics Club

In the second year of its existence, with a one hundred per cent membership, the Engineering Physics Club is taking its part in the activities of the Engineering Society.

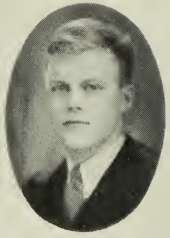
The annual banquet at which the freshmen were officially welcomed into the Club, started the year off with a flourish (for the freshmen at least).

Among the several meetings held during the year, such subjects as Tricycle Undercarriages for Aircraft, Summer Jobs, Dimensional Theory, and the Electron Microscope were very thoroughly discussed.

PROF. T. LOUDON
HON. CHAIRMAN

J.L. ORR
CHAIRMAN

H. STARK
VICE-CHAIRMAN



J. WHYTE
SEC.-TREAS.

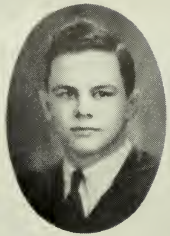
J.H. FEE
4TH. YEAR REP.

ENGINEERING PHYSICS CLUB EXECUTIVE

Faculty of Applied Science and Engineering

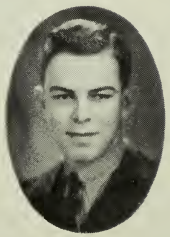
UNIVERSITY OF TORONTO

1938 1939



J. BRISLEY
3RD. YEAR REP.

T. STEPHENSON
2ND. YEAR REP.



K. KIDD
1ST. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

FOURTH YEAR ENGINEERING PHYSICS

Left to Right:

Back Row: Prof. V. G. Smith, Prof. J. Satterly, Prof. C. R. Young, Dr. L. Gilchrist, Prof. T. R. Loudon, Dr. E. F. Burton.

Front Row: C. G. S. Campbell, J. H. Fee, W. E. L. Grasham, J. L. Orr, J. A. Lundy, W. H. Jackson.

The annual dance was held in co-operation with the Mechanical Club after the January examinations and the boys proved their versatility by "swinging with the best of them."

An innovation was the presentations of talks on their thesis subjects by members of the Fourth Year, thus acquainting the junior years with the work ahead of them and providing lecturing experience for the Fourth Year. In this manner such topics as Photo-Electric Cells, the Cathode Ray Tube, X-Rays and their Application to Industry, Metal Aircraft Construction, Boundary Layer and its Control, Airplane Performance Calculations, and Constant Speed Propellers were discussed.

The Executive and the graduating class would like to express their appreciation of the interest shown and friendly co-operation given to the Club by the staff in general, and in particular by Dr. E. F. Burton, head of the Physics Department; Prof. T. R. Loudon, head of the Hydromechanic division of the Electrical Department; Prof. H. J. C. Ireton, of the Spectroscopy Department, and Prof. V. G. Smith, of the Electrical Department.

I should like to take this opportunity to thank the members of the Executive and the Club as a whole for the willing co-operation they have shown during the year and to wish you and your new chairman, "Hank" Stark, the very best of luck for 1939-1940.

May the Club have continued success and may the graduating class always have "skies clear and ceiling unlimited."

JOHN L. ORR,
Chairman.

Industrial Chemical Club

This was the thirtieth year of our Club. We feel that it has been a very successful one. This success is due in a large extent to the efforts of the executive. Each member took his responsibility seriously and did his work enthusiastically and cheerfully. We thank them for it.

The results were immediately apparent. Our membership doubled. At our opening meeting, every member was present. This was a Luncheon at Hart House in October. After a gay sing-song, the speaker, Mr. Leigh Glover—one of our recent graduates—told us about the Eveready Air Cell.

For the second event the Juniors and Seniors "shuffled off to Buffalo", via the Firestone Plant at Hamilton and the Hydro

CHEMICAL ENGINEERS—FOURTH YEAR

Left to Right:

First Row: J. L. Smart, W. A. Scott, Dr. R. R. McLaughlin, Prof. E. A. Smith, Prof. J. W.. Bain, Dr. M. C. Boswell, W. H. Rapson. M.A.Sc.

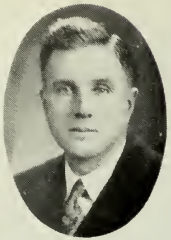
Second Row: W. F. McDonald. S. K. Sheldon, S. D. Levine, F. C. Read, E. A. Macdonald, J. J. Miller, J. A. Wickett, H. R. Green, A. H. Holden, A. D. MacEwen, G. W. Ridpath, C. H. Clark, H. M. Scott, R. J. Grasley, D. S. Montgomery.

Third Row: J. M. Werry, F. V. G. Drowley, G. T. Perry, R. B. Thompson, L. A. Quick, W. M.. Young, J. R. Hall. G. Rowlandson, R. M. Munro, P. D. Scott, F. A. P. Rosar.

Fourth Row: G. A. J. Joel, W. C. J. Krane, J. B. Moriarty, R. S. I. McLaren, D. C.. Anderson, F. W. Barlow, R. T. Waddington, J. B. MacKay, J. W. Graeb, W. G. P. Merrifield, K. M. Malcolmson.

Fifth Row: C. R. G. Holmes, J. J. Haffey, H. deV. Partridge, W. C. Macdonald, M.A.Sc., A. C. Campbell, E. C. Boyd, A. S. Weatherburn, B.A.Sc., J. J. Parchelo, L. Adler, F. R. Gerry, M. Adelman, B.A.Sc., A. M. Fitzgerald, B.A.Sc.

Sixth Row: J. C. Clark, S. Murray, F. L. Johnson.



PROF. E. A. SMITH
HON. VICE-CHAIRMAN

O. D. JOHNSTON
HON. CHAIRMAN

H. R. GREEN
CHAIRMAN

G. KENNEDY
VICE-CHAIRMAN

F. ALLEN
SEC.-TREAS.

INDUSTRIAL CHEMICAL CLUB EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

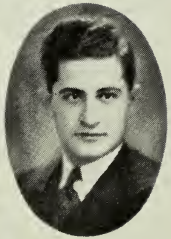
ASHLEY AND CRIPPEN
TORONTO

R. T. WADDINGTON
4TH. YEAR REP.

T. KINGSBURY
3RD. YEAR REP.

R. FUGLER
2ND. YEAR REP.

R. SMART
1ST. YEAR REP.



I. A. DAVIS
1ST. YEAR REP.

Electric Power Plant at Chippawa, Ontario. This is an annual affair, but was crowned this year by a complimentary Luncheon given by the Firestone Company. Later in November, a Dinner meeting was held in Hart House. Mr. O. D. Johnston, our Honorary Chairman for the year, outlined the "Production and Distribution of Alcohol". This was naturally of great interest to all Chemical Engineers.

It has oft been said that the quickest way to a man's heart is through his stomach. This was already apparent from the attendance at our first Dinner meeting, and the system was therefore continued throughout the year. Thus, one evening in December, a well-fed gathering was thoroughly entertained by seeing Mickey Mouse on the screen! Mickey was followed by "Celite", a film prepared by Johns Manville Company and brought to us with complete explanations by Mr. J. C. Honey. All agreed that this was the best meeting of the year.

The January meeting brought us up to date on Air Conditioning. This was very well described and illustrated by Mr. Cyril Tasker, of the Ontario Research Foundation, who is an expert on the subject. Early in February we were honoured to have with us Dr. R. K. Stratford, of the Imperial Oil Company, and President of the Canadian Chemical Association. Dr. Stratford outlined old and new processes of oil refining with reference to his own research work and the future trends of chemical industry.

A final spike was driven early in March at a Luncheon meeting with Mr. N. C. Hobson as guest speaker. A demonstration of some of the new products of synthetic organic chemistry made his address outstanding.

Now, with sincere regret, I turn over the Industrial Chemical Club to your new Chairman, George Kennedy. I know that he is very capable of the job and I wish you all good luck and a great future.

HUGH R. GREEN,
Chairman.

The Electrical Club

Another School year has come and gone, leaving behind it fond memories of a University life now completed for some, while for others, it means but a further stride towards this objective. We believe the Electrical Club has contributed a great deal to the

W.C. WARD
SEC.-TREAS.

W.W. RAPSEY
CHAIRMAN

PROF. H.W. PRICE
HON. CHAIRMAN

D.E. McGREGOR
VICE-CHAIRMAN

H.M. ROBINSON
4TH. YEAR REP.

ELECTRICAL CLUB EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

H.B. MUCKLE
3RD. YEAR REP.

D.G. JOHNSON
2ND. YEAR REP.

R.K. PILE
1ST. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

FOURTH YEAR ELECTRICALS 1938-39

Left to Right:

Back Row: P. C. Anderson, J. H. Gilbreath, W. C. Moull, A. A. McArthur, D. M. Manson, A. E. Glazer.

Second from Back: W. B. Coy, J. Harold Ross, A. D. Hood, H. M. Robinson, G. R. Currie, G. A. Richards, K. D. Taylor, J. A. Norman.

Second from Front: W. G. Robbins, Joe H. Ross, T. E. Flinn, D. B. Kilgour, G. A. Cooper, C. H. Vatcher, W. W. Rapsey.

Front Row: Mr. R. J. Brown, Mr. L. S. Lauchland, Prof. V. G. Smith, Prof. H. W. Price, Prof. A. R. Zimmer, Prof. G. F. Tracy, Prof. D. deV. Bayly, Mr. J. E. Reid.

Insert: R. J. Orok.

enjoyment of our strenuous academic year by providing an opportunity for the men of all years to meet socially, and to promote a greater fellowship amongst them.

To this end, the Club activities have taken a slightly different form from previous years. We first were visitors at the A.I.E.E. meeting which dealt with Toronto's shiny new T.T.C. street cars, and the talk and actual demonstration were most capably handled. The Fourth Year snatched a day off from their busy lab to make the time-honoured Buffalo trip. Mr. Willson Woodside gave us one of his intimate talks on "Europe," which also are becoming a time-honoured custom appreciated by all.

That Bowling Night of ours proved a fine thing. The boys seemed quite wrapped up in their work. That's more than can be said for them at the Roller Skating Night, for then they were spread out all over the place.

Col. Joy, who is Civil Aviation Inspector, gave us a very interesting introduction to "Radio Flight Control" at our next meeting, and the programme was rounded out by the showing of natural colour slides taken in Bermuda.

The next Smoker featured Mr. R. M. Thomas, of Perfect Circle Piston Ring Co., speaking on "Don't Make the Mistakes I Made When I Left School", which proved valuable to everyone. The second bout on this same evening was a showing of two excellent technical films provided by C.G.E.

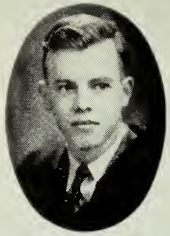
The grand finale took the form of a Dinner at the Toronto Hydro Electric Club, featuring a three-ring circus. Mr. Nicholas Ignatieff, of the Schools Exploration Society, told us of his proposals for University men in the society, and showed a lovely coloured film taken in the Rockies on one of his trips. Then our own Al. Glazer brought us some talkie shorts as added entertainment to round out a real evening.

And so as we pass out of School, and we wish those who follow all the pleasurable experiences that have been ours, and hope the Club continues to receive the active support of all its members. Our thanks for the fine co-operation received this year from executive and members.

W. W. Rapsey.

S P.S. Debates Club

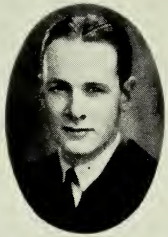
The S.P.S. Debates Club swung into action last fall, just before Initiations, in time to give the freshmen an opportunity to raise



P.E. PASHLER
VICE-CHAIRMAN

PROF. PRICE
HON. CHAIRMAN

H. DEV. PARTRIDGE
CHAIRMAN



R.A. GREIG
SEC.-TREAS.

F.C. READ
4TH. YEAR REP.

DEBATING CLUB EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

J.C. FINLAYSON
3RD. YEAR REP.

B.E. ETKIN
2ND. YEAR REP.

D.V. SCHMIDT
1ST. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

their voices in protest against this age-old rite. Speakers were from the First and Second Years. The Sophs, M. Bishop and B. Etkin, successfully upheld their views and the ceremony was carried out with due solemnity.

"A horse of a different colour," namely Dictatorship vs. Democracy, provided the serious subject in the fall term. No world-smashing decision was reached, although much lively discussion was evolved.

"Resolved that S.P.S. should not employ American talent for Social Functions" proved to be the vehicle for a fast moving and humourous discussion, punctuated with reminiscences and pleasant memories. The wisdom of the decision in favour of the American talent was amply demonstrated by the success of the School Formal. The speakers for the motion were Park Reilly and George Joel, and against the motion were Bill Scott and Rowed Greig.

A joint meeting of the Engineering Society and the Debates Club was held in January, at which papers on Engineering subjects were presented. The first prize was won by Bill Bruce with his paper on "Science in the Foundry".

March found the Club facing the final in the Segsworth Trophy Debates. The winners in the two preliminary debates were John Hogan and H. Davis, of First Year, and B. Etkin and N. Bennett, of Second Year.

The Spring Elections provided the Club with an excellent Executive for the coming year and we wish them every success.

H. deV. Partridge,
Chairman.

The Leader of the Band

The New Engineering Club

F. P Meschino

For years a story has been heard, a prophecy, a great dream from the lips of those who have trodden through the portals of our noble shack of learning. Some, who in their youthful student days looked with hopeful and yearning eyes toward a vision which seemed so near and yet so far. This desire for a vestige of what we have been seeking, like patient, devout pilgrims awaiting the return of Christ, to the great joy and unbounded ecstasy of loyal suffering engineers, has at last manifested itself.

Schoolmen gaze fondly and reverently on the beloved red school house for the last time, because a new school will soon rise where once rested its old red bottom.

A short time ago, a board of design, consisting of two members from each department of S.P.S. was selected to prepare the design drawings. It took two hours of intensive research work to bring the entire scheme to a point of completion presentable to Council. A meeting was arranged by the Board with Federal authorities, and with the termination of negotiations a $75,000 Engineering Club was approved and a $2,000,000.00 cheque was obtained to begin operations.

The new Club, to be owned and operated by the Federal Government, will admit any Canadian citizen who can drink forty beers. It will be sixty-five floors high, constructed of concrete,

steel and glass, and will contain the living quarters for 7,500 members, an athletic wing, a centre for daytime living, a recreational lounge for night life in the top sixty-five floors, a medical centre, a small room in the basement for freshmen, and incidentally the remaining space will be for academic work.

Each member is to have a private air-conditioned suite, equipped with hot and cold running beer, for intellectual and sanitary living, where he can pursue sentimental research. His rooms will contain a two-way television unit from which he will be able to tune in to any lecture that he will be unable, or unwilling to attend in person, because of illness, lateness, or just because. The exterior walls of his suite will be completely of glass (as will the walls of the building itself) two layers thick with an air space between, on the thermos bottle principle, so that there will be clear vision from the inside but translucent from the outside, creating a broader sense of living; that of living outdoors yet being indoors. Every member will have a bronzed figure all year round as sunbathing behind the glass walls that will develop ultra violet rays even on the dullest days, will become a daily habit while listening to lectures on his television. In the evening the suites will be indirectly lighted, the system so controlled as to produce any intensity of illumination to suit the temperamental moods of students.

The centre for daytime living of the new Engineering Club will bring about another addition to college life; a broader sense of friendship and brotherhood. In this area there will be great lounges, dining halls, rooms for billiards, ping pong, cards and chess, movie theatres showing current pictures, and a concert hall featuring popular artists. Members will spend their free moments relaxing in this area, destined to become the hub of the Club.

Perfect diets will be outlined for each individual of the Club, by the Medical Centre and served to them by the dining rooms. It was felt by the board that this type of service has long been overdue.

The compact form of living at the Club will give members many hours of free time every day to spend on extra curricular activities. The recreational lounge, where there will be dancing to every type of music from swing to swing, has been included for this purpose.

The new School with its new sense of living, is bound to bring about a greater class harmony and international good-will, and while engineers are now the secret envy of every medical student, they will become the undisputed philosophic, social and cultural leaders on the campus.

School Nite

On Friday, February 17th, Schoolmen once again demonstrated their superiority over all other faculties in yet another line when the fever of School Nite reached its zenith and Toike Oike took over Hart House. No less than five orchestras were necessary to accommodate the frolicking fancy of some eight hundred engineers and their choice of the fairest. The gaily decorated halls resounded again and again to the hunting cry of the forty beersmen.

Necessity compels us to admit that the "revue" of '39 will certainly rank among the first of all school revues, the highlight of the Toronto campus. We must pause, with perhaps two minutes silence, give honours to E. H. Hymmen, the brain child of the revue.

Passing sadly from the revue, the next item of interest was by the Famous Toronto Dolphinettes who show how adapted humans may become to water. This was followed by the mad antics of a Mr. Aubrey Ireland and his canoe, for whom the pool was lengthened so that he could demonstrate the rigours of long distance paddling.

A spectacular gym display was executed by the Varsity Gym team in the Big Gym, which was claimed by some as the "steal" of the evening.

After this performance was over, the poor Schoolmen were left to fend for themselves against the charms of the fair sex, who had to aid them, the five orchestras. Outstanding among these, were the "Modernaires", in the East Common Room who more than did their part to keep our minds on the music.

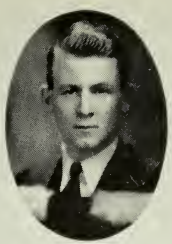
Along about 11.30, we were inveigled away from tripping the light fantastic long enough for cake and coffee in the Great Hall. Then back to lilting laughter, soft lights, and sweet music until two o'clock, when the doors were locked and we found ourselves on the outside looking back on only a fond memory.

This festive occasion was graced by the patronage of Mrs. H. S. Cody, Mrs. C. H. Mitchell, Mrs. R. W. Angus, Mrs. J. W. Bain, Mrs. H. H. Madill, Mrs. H. W. Price, Mrs. G. A. Guess, Mrs. C. G. Williams, Mrs. C. R. Young.

This leaves us with only one thing to say in appreciation, to the School Nite Committee—"—a good thing—well done".

S.M.S. Dunn
FINANCE

P.C. Anderson
PRESIDENT



A.A. McArthur
CHAIRMAN

P.D. Scott
VICE - CHAIRMAN

E.H. Hymmen
REVUE

SCHOOL NITE COMMITTEE

Faculty of Applied Science and Engineering

R.T. Waddington
MUSIC

UNIVERSITY OF TORONTO

1938 1939

H. Kortright
RECEPTION

D.R.B. McArthur
TICKET SALES

ASHLEY AND CRIPPEN
TORONTO

J.C. Anderson
PUBLICITY

A.D. Moore
ACCOMMODATION

School At-Home

The much-heralded 1939 School At-Home—party of parties—took place on the Convention Floor of the Royal York Hotel, January the twentieth. Over twelve hundred Schoolmen and their ladies danced to the "Rhythmic Pyramids" of Richard Himber and his orchestra. Ably assisting him in the Crystal Ballroom was Toronto's own Trump Davidson.

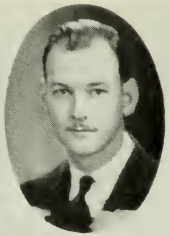
The affair was conducted as an experiment to maintain the prestige of School At-Home, as the foremost social function of the University. Its success was due to the spontaneous enthusiasm of Schoolmen, both undergraduate and graduate. Indeed it hardly could have ended in such a happy financial state without the support of the graduates.

The distinguished patronesses were: Mrs. H. J. Cody, Mrs. C. H. Mitchell, Mrs. C. R. Young, Mrs. C. G. Williams, Mrs. R. W. Angus, Mrs. H. H. Madill, Mrs. J. W. Bain, Mrs. H. W. Price, Mrs. G. A. Guess.

Among the guests were: Prof. and Mrs. W. J. T. Wright, Prof. and Mrs. W. J. Smither, Mr. A. E. Macdonald, Prof. and Mrs. C. F. Morrison, Mr. and Mrs. W. S. Wilson.

Contrary to the usual custom, a supper was not served, but the orchestras played continuously until three o'clock so that everyone had ample opportunity to "swing it" with the music. At intervals throughout the evening amusing caricatures of the guests were drawn by Mr. Hugh Forbes before an admiring throng. With a final medley ending in the "One o'Clock Jump" the very weary but still joyful crowd bade *adieu* to School At-Home for nineteen hundred and thirty-nine. May it live forever!

The Ballroom School-At-Home



J.C. ANDERSON
PUBLICITY

A.A. MCARTHUR
CHAIRMAN

P.C. ANDERSON
PRESIDENT

J.H. ROGERS
VICE-CHAIRMAN

S.M.S. DUNN
FINANCE

SCHOOL AT-HOME COMMITTEE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

G.P. DEWAR
TICKET SALES

G.B. DEWART
ACCOMMODATION

J.B. MORIARTY
RECEPTION

ASHLEY AND CRIPPEN
TORONTO

B.H. TEDMAN
PROGRAMS AND DECORATIONS

K.W. MALCOLMSON
DELEGATES

J.C. ANDERSON
PUBLICITY

S.M. DUNN
FINANCE

A.A. MCARTHUR
CHAIRMAN

P.C. ANDERSON
PRESIDENT ENG. SOC.

W.H. POWELL
VICE-CHAIRMAN

F.F. WALSH
TICKETS

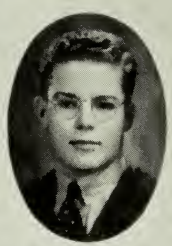
E.H. NOAKES
DECORATIONS

SCHOOL DINNER COMMITTEE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939



B.H. TEDMAN
PROGRAMMES

H.G. RONSON
ACCOMMODATION

J.F. FORD
MARSHALLING

ASHLEY AND CRIPPEN
TORONTO

M.R. MACPHERSON
RECEPTION

J.B. MORIARTY
ENTERTAINMENT

49th Annual School Dinner

The 49th Annual School Dinner held in the Great Hall of Hart House, Thursday, November 24th, 1938, will long be remembered by Schoolmen. "School" spirit was the keynote of the evening, and the well-chosen words of the President of the Engineering Society guided the many speakers skilfully through the varied programme.

"The Status of An Engineer" was the subject chosen by the guest speakers, Dr. J. B. Challies, President of the E.I.C.; Austin Wright, General Secretary of the Institute and Fred Newell, Chief Engineer of the Dominion Bridge Co. Each talked for a time on the different aspects of the engineering profession.

Dr. T. H. Hogg, made the presentation of scholarships to the brighter lights of School and the Gold Keys to graduating members of the Engineering Society Executive Committee, and Athletic Association. One of the most prominent and popular of graduates, he was enthusiastically greeted and will always be assured of a warm welcome from Schoolmen.

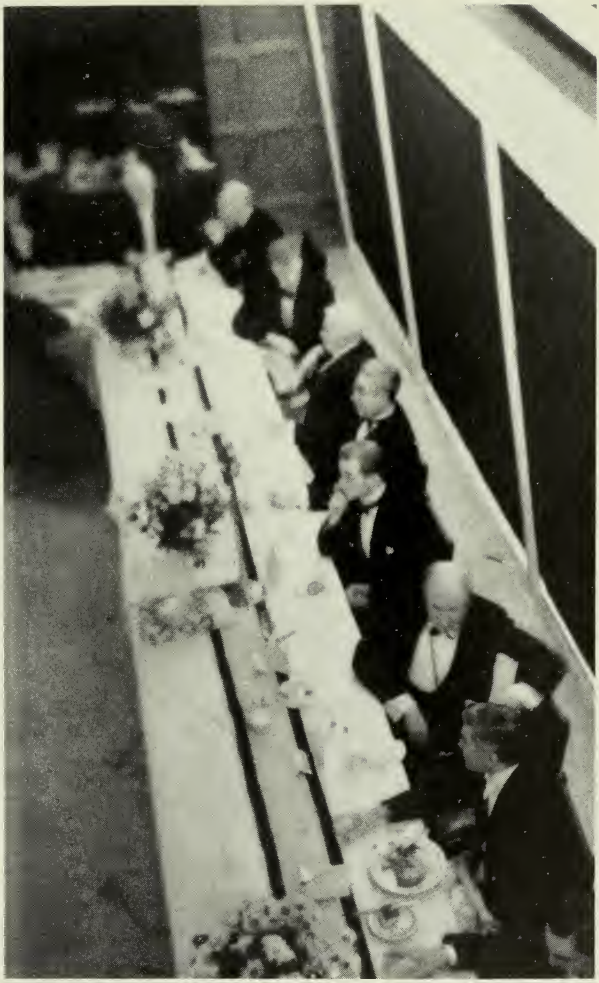
Dr. Cody, the President of the University, in a brief but inspiring speech, left a message to engineers which will not soon be forgotten by those who were privileged to attend. In reply to the toast to the Faculty of Applied Science and Engineering, Dean Mitchell made one of his most successful addresses.

A short sing-song followed the bountiful meal of turkey with all the trimmings. At intervals throughout the evening, musical entertainment was provided by the three Strings and an exhibition of juggling and balancing held the audience spellbound.

With the booming echo of a resounding "Toike Oike", the 49th Dinner came to an end—may the spirit which permeated all those present long flourish for the continued advancement and unification of the engineering profession in Canada.

Graduation Ball

The noble Seniors, very straight and restrained in their boiled shirts, gathered with their fair ladies for the most colourful and hoped-for party of their entire career, the Grad Ball. This event of events was held in the Crystal Ball Room of the Royal York and March 31st is the date to be remembered.



HEAD TABLE SCHOOL DINNER

Mel Hammill and his Genial Gentlemen entered into the spirit of the occasion which contributed materially to the success of the evening. A tasty supper was served to the "thirty-niners" and their friends at midnight. The chemicals with their traditional dramatic trend, with a frew recruits from other departments, added much to the humour of the evening by their Revue.

Prestige was lent to the occasion by the presence of the wives of members of the faculty and we trust that they enjoyed the event as much as their hosts.

Mingled with the joys of the evening was a note of sadness and regret that in a very short time we would all be dispersed. But the "Spirit of 3T9" which was so well portrayed during the evening still exists and will continue to exist and we do hope to have more parties like it in the years to come.

Toike Oike

With the Graduation Edition on March 31st, Toike Oike presents the final issue of the year. The customary eight papers have appeared at intervals of about one month, together with several sheets of advertising for various S.P.S. Dances.

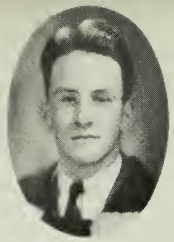
An attempt has been made to fulfil the obligations of a "School" paper in providing: "Humour"—in the form of jokes, "Alley-Kittens", etc., and also to afford election candidates, Clubs and Year Committees with a medium for their announcements. While it was not found possible to carry out the original idea of a paper embodying recent developments in Engineering both technical and professional, to any great extent, it is hoped that the following year may attain this objective.

The publication of the "Toike Oike" is in the hands of Mr. Weir of the University Press, and the thanks of the staff is extended to him for his co-operation, often under very short notice. For the material, we also wish to thank Jack Orr, Bill Jackson, and Jim Lundy, who have contributed consistently and above all Dean Mitchell, whose articles have appeared in nearly all issues.

Among the casual contributors we may mention, Professor T. R. Loudon, Mr. M. J. C. Lazier, Tom Cooke, Jack Fee, Eric Bonham, Paul Anderson, Jim Anderson and Creighton Mitchell.

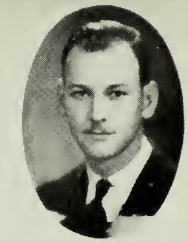
To conclude this rather dry bit of literature in the conventional way we wish our successor lots of luck and ourselves lots of the same in the trials of April.

C. G. Campbell.



J.H.FEE
FEATURE EDITOR

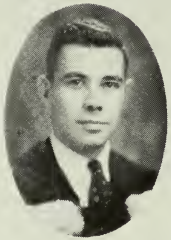
C.G.S.CAMPBELL
EDITOR



J.C.ANDERSON
DIRECTOR OF PUBLICATIONS
AND PUBLICITY

J.L.ORR
ASSISTANT EDITOR

J.A.LUNDY
SPORTOIKE



W.H.JACKSON
4TH. YEAR REP.

TOIKE OIKE STAFF

Faculty of Applied Science and Engineering

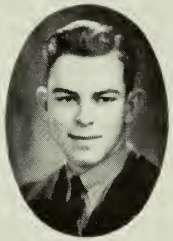
UNIVERSITY OF TORONTO

1938 1939

C.M.MITCHELL
3RD. YEAR REP.

E.BONHAM
2ND. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO



K.KIDD
1ST. YEAR REP.

Survey Camp---1938

Highlights

Arrival at Camp—discovery that professors can and do let their back hair down—meal time stampedes—introduction into the intricacies of getting into the upper bunk without breaking a leg—decision that something ought to be done about the flies—back of bunkhouse littered with jallopys of different vintages—aforementioned rattling down the main drag of Minden and pulling up outside the Minden House—Sinclair playing a lullaby—trips down the lake in the Queen Mary—those Saturday morning tests—Ross carrying the torch of life—bunkhouse dance with too much noise as usual—the sign painting fever—the Dean's arrival and departure—horse shoes and rugby balls flying in the bunkhouse windows—a refreshing sleep under a shady tree while Bill yells for a picket—Bolton's birthday party—the dinner gong in the still of the night—beer and peanuts—Party 3 hitting everything on the nail—hmm—being lulled to sleep by the chants of the African golfers—the supps, God bless 'em—the farewell party on the Minden House and Thompson's birthday party that night—a very wet departure.

Queries

What about putting P. J.'s bed in the lake?—What does Wilson see in the Minden twins?—Who is going to paint the sign?—Where is the dance to-night?—Who has the dice?—Were you at Bolton's birthday party?—Lend me a buck?—Who swapped my tee square?—How about letting us get some sleep?

Quotations

Where is my pipe?—Williamson. It's a natch—Garcia. How about you guys getting some wood for the fire—Wood. Another zero!—Kingsmill. Who will give us a push?—Wardell. Fix the radio—McCabe. But I tell you officer, we *weren't* making a noise—Ross. What are the girls like down the lake—Bryce. I guess we, that is I, made a mistake—Grier. It's my twenty-third—Bolton. Now I am a Sigma Xi—Woods.

Lowlights

Quote, "Between the hours of 8.30 to 11.30 A.M. and 1:00 to 4:00 P.M. there must be no boating, games or use of the bunk-


4To

house"—Unquote. It's slavery that's what it is! Anyway it's too bad, I says, but then not everyone could have the foresight to take Mining or Civil. We, the chosen few, have had the experience of living with, working and relaxing with, and above all, really knowing the fellows, who for the past two years, have been merely another Miner or another Civil. Our six weeks at Gull Lake was something well worth while and its inclusion in our course should make Departments three to nine inclusive, green with envy. But, ignorance is bliss, they tell me. However, I do think we owe a vote of thanks to those Professors who did so much to make our stay enjoyable as well as academically profitable.

W. K. Clawson.

Class of 4T2

All summer long we had yearned for the cool autumn days and glorious football weather, but when we arrived at the Little Red School House last fall we found little time for such spiritual matters. We started to wonder how long that money would last, and why we spent so much for blue cards with green ties entailed. Then, after the Dean's address, we learned what the green ties meant and also that water has other than cleansing values. The Frosh, forming an even larger year, put up a brave fight and caused no little trouble to the Sophs.

After the Frosh easily secured the flag on that memorable afternoon of the First Year Reception, the vanquished Sophs treated us to green buttons, entertainment and food, and turned out to be nice fellows.

We met the Sophs (and the Juniors) socially at the Soph-Frosh. It was held at the Royal York, and Bob Lyons assisted in making it a success.

After taking life fairly easy and beginning to see what lectures were for, we held a party at the Boulevard Club before the holidays. A large number turned out in spite of cold, wintry winds, and packed the place.

The holidays passed quickly and we returned to try exams (at least most of us did).

Then, on the first day of February, we held another year party at the Silver Slipper. Once again winter proved very unyielding and many found difficulty with large snow drifts. However, a good time was had by all.

The weeks flew by and the exams drew nigh, but just to show them we were ready, we held the Junior-Soph-Frosh in conjunction with the Second and Third Years.

And now that is over, and we are left to wonder what those much-dreaded affairs will be like and if we shall pass them! But looking back on a year with the School Dinner, School At-Home, and School Nite passing in review, we realize that we need something to bring us back to earth.

Good luck to all and best wishes to the new Executive. I hope they will arrange an excellent welcome for the Class of 4T3.

CROFT HUDDLESTON.

Class of 4T1

Well, where we are, our sophomore year almost over (for good, we hope), and what a gala year it has been! Boy, were we glad to see those Frosh when we got back? (Only there didn't need to be so darn many.) They were pretty slow at learning Toike Oike, too. And E G G S ! ! ! Seems to me I remembers the Dean saying something about eggs in his Economics lecture and it wasn't in connection with Canadian exports, either.

But the Soph-Frosh brought a peaceful end to it all. And incidentally not a bad party—thanks to the Frosh.

Christmas will be remembered for the pre-holiday Dance, exams and those lovely little Faculty greeting cards which did not arrive till the end of January, due to heavy snows or something.

Another party out at the Boulevard Club helped break the monotony of "Now, gentlemen, if you would all get here at five minutes after the hour, I would let you out five minutes early."

And Richard Himber, eh! Who says we can't throw a better party than the Meds? School Nite! Well, we won't go into that but it will certainly be remembered. And the Junior-Soph-Frosh to end it all before the boys begin to turn on the heat. Considered by many who know whereof they speak to be the quietest S.P.S. Dance in ages.

Well, some of us may be Juniors next year (if they can raise the Lab accommodation). And that means one-half of this grand and glorious course is over. Ah, me!

4T0

Juniors! Like music to the ears, that word! The effervescent buoyancy of our Sophomore days gives way to quiet dignity. At least we did feel slightly more grown up.

At the opening of the year a certain epidemic of undefined "sickness" swept the class; in fact it swept them right out of the lecture rooms and down to certain well-known opera houses. However, it didn't take us long to find out that we were really in for a going over, for if it wasn't three lab reports to look forward to, it was six.

Nevertheless, everything was not misery. We were able to attend the famed Soph Frosh on our Year Cards by arrangement with First Year, and needless to say very few missed the opportunity. Again, before the Christmas holidays we moved en masse to the Boulevard Club where, to swell music and on a good floor, everyone really enjoyed themselves, despite the Lambeth walk.

Finally the Junior Soph Frosh Prom at the Royal York capped the social season and left us with nothing to look forward to but the inevitable.

Third year was not without its famous sayings. Some of the most remarkable we will recall were:

"This year I will make my exam questions ambiguous to see if you understand your work." . . .

"If you turn to page 16 of my book, you will see . . ."

"Would you please put your hand over your mouth when you yawn." . . .

"Gentlemen, I will be forced to lock the door if you can't get here on time", and so on. . . .

Boxing, football, hockey, fencing, lacrosse, swimming, in fact every line of Athletic activity without singling out any names, 4T0 as a whole has led School. Let us hope we will continue to lead in the years to come.

It has been a great year for all of us, and may every one, to a man, get over the hurdles. Good luck to Sandy McArthur and the incoming executive for a bang-up graduation year.

Fred. F. Walsh,
President.

Class of 3T9

And so we come to the end of our undergraduate days. But what an ending! The members of the Class of 3T9 were determined

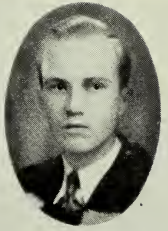
S. MURRAY
ATHLETIC REP.

C.H. VATCHER
SEC.-TREAS.

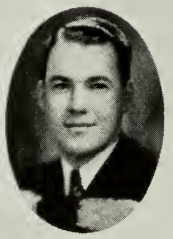
C.D. DICK
PRESIDENT

K.W. MALCOLMSON
VICE-PRESIDENT

F.C. READ
DEBATES REP.



M. HOWE
CIVIL REP.



R.T. WADDINGTON
CHEMICAL REP.

FOURTH YEAR EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

J. SUGARMAN
ARCHITECTURAL REP.

W.J. NICHOLS
M. & M. REP.

D. CLOSSON
MECHANICAL REP.

ASHLEY AND CRIPPEN
TORONTO

H.M. ROBINSON
ELECTRICAL REP.

J.H. FEE
ENG. PHYSICS REP.

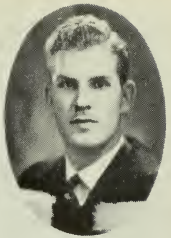
J.C. ANDERSON
COUNCILLOR

F.C. READ
SEC.-TREAS.

A.A. McARTHUR
PRESIDENT

P.C. ANDERSON
VICE-PRESIDENT

R.A. RULE
VICE-PRESIDENT



A.H. KINGSMILL
COUNCILLOR

R. BOYD
COUNCILLOR

PERMANENT EXECUTIVE OF THE CLASS OF 3T9

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939

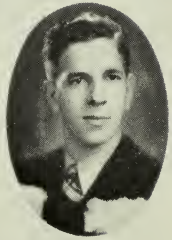
A. GLAZER
COUNCILLOR

F. MESCHINO
COUNCILLOR

J. ORR
COUNCILLOR

ASHLEY AND CRIPPEN
TORONTO

H. GREEN
COUNCILLOR



L. TRAIN
COUNCILLOR

to make this last year the most colourful and active of the four and they succeeded.

Although the individual members of 3T9 continued as in former years to dominate the athletic field the spirit of the Class as a whole was best evidenced in its own social functions.

The Senior Fall Prom held in the Boulevard Club was an outstanding success; not because of the preparations made but because of that underlying quality of good fellowship; a characteristic of any 3T9 gathering.

The major stag event took place in Hart House where the graduate Engineers welcomed us into their midst with a splendid banquet. Such merriment and frivolity and nobody hurt!

And then came the inevitable explosion of the social whirl—the Graduation Ball, held in the Crystal Ballroom of the Royal York. This dance which should have been sad but wasn't rang with high laughter until the early hours of the morning.

And now as we graduate we raise our hats to the School which taught us, not only the principles of our profession, but also the fundamental rule of good living—to fight hard and play fair—and we enter the outside world with the firm resolve that the School will always be proud to call us her own.

C. D. Dick.

Permanent Executive 3T9

The Class of 3T9 has built up an enviable tradition during its four brief but happy years. These years are packed full of memories which shall be told and retold with ever-increasing gusto.

Did we not institute the annual Stadium push-ball game? Did we not push valiantly for 3T9 (not to mention ourselves, of course, when we landed underneath the ball)?

Our two bold and daring invasions of U.C. shall ever be remembered, not by fines imposed or by the wondering and gaping Arts men, but by our own comradeship.

The dearest memories of all were gathered in the "Old Red School" itself, at our own social gatherings, games, and even in our tapping parties. Thus the "Spirit of 3T9" has grown and flourished.

It is the intention of the Permanent Executive, with the help of each individual member of the class, to maintain this friendship and co-operation throughout our lives.

The Executive wishes to keep a complete record of everyone: your whereabouts, health, position, are interesting to everyone. Members who are not settled by the end of the year are requested to mail in their location cards to the secretary, Cyril Read, as soon as they are located, so that he may keep all the information complete and up to date in his files.

Your Permanent Executive is willing to work for you. Write to them about your ideas; about any information you require; or just for old time's sake. They will always welcome your letter and be tickled to reply.

We will keep in touch with you by personal correspondence, by our own publications, and by the University of Toronto *Monthly*.

We ask you to co-operate with us and with the University Alumni itself to maintain the "spirit" of the University, of the Faculty and of the Class of 3T9.

Your Executive extends their heartiest wishes to you all and it is their sincerest hope that you may ever enjoy the best of luck throughout the coming years.

President:
A. A. McArthur
25 Willowbank Blvd.
Toronto, Ontario.

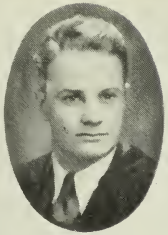
Secretary:
F. C. Read
36 Sixth Avenue
Timmins, Ontario.

School Politics

SCHOOL ATHLETICS
1939

ENGINEERING
SOCIETY

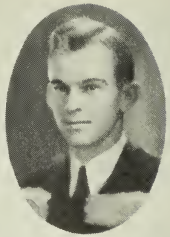
THE UNIVERSITY OF TORONTO



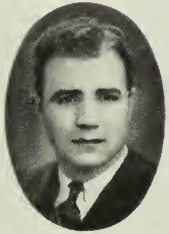
F. J. DOBSON
VICE-PRESIDENT

J. F. FORD
PRESIDENT

PROF. SMITHER
HON. PRESIDENT



P. C. ANDERSON
PRES. ENGINEERING SOCIETY



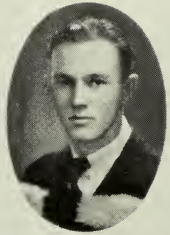
K. M. MACQUARRIE
SEC.-TREAS.

ATHLETIC ASSOCIATION EXECUTIVE

Faculty of Applied Science and Engineering

UNIVERSITY OF TORONTO

1938 1939



W. L. AARI
ADVERTISING MGR.

S. MURRAY
4TH. YEAR REP.

J. J. PIGOTT
3RD. YEAR REP.

ASHLEY AND CRIPPEN
TORONTO

L. A. LAMBE
2ND. YEAR REP.

J. W. BELL
1ST. YEAR REP.

S.P.S. Athletic Association

Hurray! "School" is out in front again. After winning the T. A. Reed Trophy last year, "School" seems to be a sure bet to repeat this year.

With more teams entered this year it is believed that more Schoolmen took part in sport than ever before. Then the Engineers won interfaculty championships in rowing, harrier, swimming and B. W. & F., with hopes still running high in baseball, basketball, and hockey.

Many Engineers have also taken their place on University teams, being particularly predominate on the rugby, hockey, gymnastic and B. W. & F. squads.

On March 1st, school athletes gathered at Hotel Embassy to honour themselves at the final "S" Holders Banquet, which was voted a grand success.

In closing, we would like to thank every Schoolman for supporting this year's Executive so well and sincerely hope this spirit may continue with the incoming Executive.

JOHN F. FORD,
President.

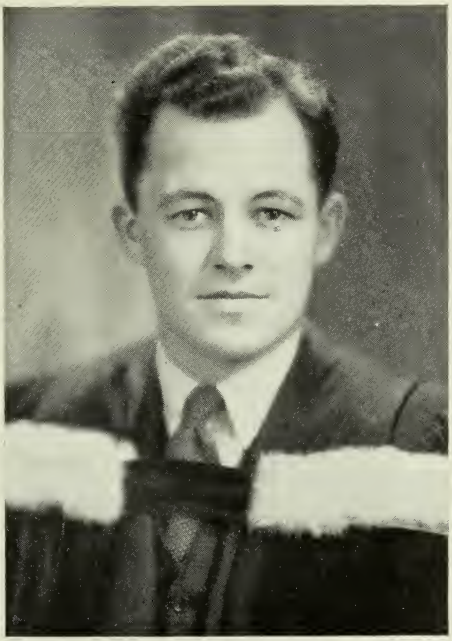
S.P.S. First "T" Holders

As in past years, School has contributed generously to the intercollegiate teams representing Varsity. Their activities have been varied and in all cases worthy of a first colour holder.

Norm. Beattie, Jim McDonald, Bill Schwenger, Ken. MacQuarrie, Doug. Turner, Murray Scott, Bill Rowland and Frank Sirdevan have all earned theirs for rugby. Tommy Callon and Johnnie Ross for hockey, George Powell for soccer, and Bill Laari for water polo. Dave Crichton, Gord. McHenry and Bill Hogg for track and harrier. In B. W. and F., Schoolmen really excelled, with Jack Pigott, Bill Schwenger, Adam Hood, Bill Ramore, Frank Dobson, J. Mustard, Art Scott, Al Garcia and Bob Wilson obtaining their letter in this way. J. Girvan in swimming, Bill Pigott in tennis, and Jack Smith in rowing, also were active. Then Patterson, Lester and Mark took theirs in gymnastics.

"T" HOLDERS

Second Row: W. Laari, G. Powell, R. Wilson.
First Row: W. Ramore, A. Hood, W. Hogg, F. Dobson.



The Bronze "S"

Schoolmen of 3T9 take "hats off" to Bob Galway, who was declared their outstanding athlete about to graduate. Not only is Bob popular among his team-mates but also with his other classmates, whom he always greets with his flashy smile.

Bob graduated from Jarvis C. I. to take up engineering at S. P. S. with lots of sport thrown in. So in his first year, he played interfaculty rugby and hockey with the Varsity intermediates. In his second year, he played interfaculty hockey and rugby, moving up to the Varsity Intermediates Rugby Team during the season. During his third year Bob had the misfortune to break his ankle playing rugby for "School". However, he came back to play interfaculty hockey and baseball. Then in fourth year we have Bob playing Varsity Intermediate Rugby and interfaculty lacrosse, hockey and baseball. During this time, Bob also played T.H.L. hockey and baseball in the summer months.

Besides these athletic feats, Bob took time to be second year representative and secretary-treasurer in his third year of our Athletic Association.

Summing this up we have the final results:

Star quarterback in rugy; star goal-getter in hockey, and star pitcher in baseball.

So with these results behind you, Bob, we take "hats off" again and wish you the very best of luck in the future.

Phene Memorial Trophy

The Phene Memorial Trophy Cup was awarded this year by the Senior football team to the man who, in their opinion, best represented and displayed the qualities of sportsmanship, enthusiasm, and leadership, both on and off the rugby field. Their choice of all Schoolmen was Jack Ford, the President of the Athletic Association.

Due to Jack's ceaseless efforts to get more teams in all sports from School, not for the sake of winning championships alone, we have this year seen dozens of new faces on the athletic fields, tracks and gyms. These fellows are all out there playing for the pure love of the game and are fulfilling wholeheartedly the idea that our President has tried to leave with us.

Jack has played rugby, baseball and hockey for School, and was chosen on the all-star Interfaculty Rugby Team. A more diligent worker on the Association, or a harder and cleaner player on the field can hardly be imagined.

Congratulations Johnnie!—and we are sure your future acquaintances will share our thoughts and feelings of you—one swell guy!

Sports

It is unfortunate that at the time our magazine goes to press scarcely any of the play-offs in Winter Athletics have begun. However, with so much still undecided it certainly looks like the best year for School in a long while. It looks as if we will take the Reed Trophy with much more ease than last year.

At the present time, all three hockey teams may be in the play-offs. The Junior baseball team should pull through and also the Junior basketball squad.

S.P.S. have won the silverware in harrier, B. W. & F., swimming and gymnastics out of nine decided championships and has strong entrants in three of the four undecided title races.

All in all it has been a most successful year, and all that remains to end it properly is the winning of the Reed Trophy, for the second successive time since its donation (which is practically in the bag).

HERB COONS,
Sports Editor.

Football

School fielded two strong football teams this year, and for the first, they placed a team in the Mulock cup final.

Senior School were grouped with the high-flying Senior Meds and St. Mike's. They were out-lucked in the first game with St. Mike's to a 2-all draw after having much the better of the play and with a kick-for-point called back twice.

In the second encounter of the season, the doctors tramped all over the engineers and with the aid of some beautiful pass plays and superior kicking, accumulated 20 points while holding the engineers scoreless.

School turned in a fine performance in their second game with Meds and held their opponents to a 7-1 score. The medicine-men paved the way for the only touchdown of the game by recovering a school fumble on the 7-yard line.

Although definitely out of the running at this stage, the boys came back for their last game with the true "Spirit of the Old School", and were barely nosed out, 6-5 by St. Michael's in a very close game.

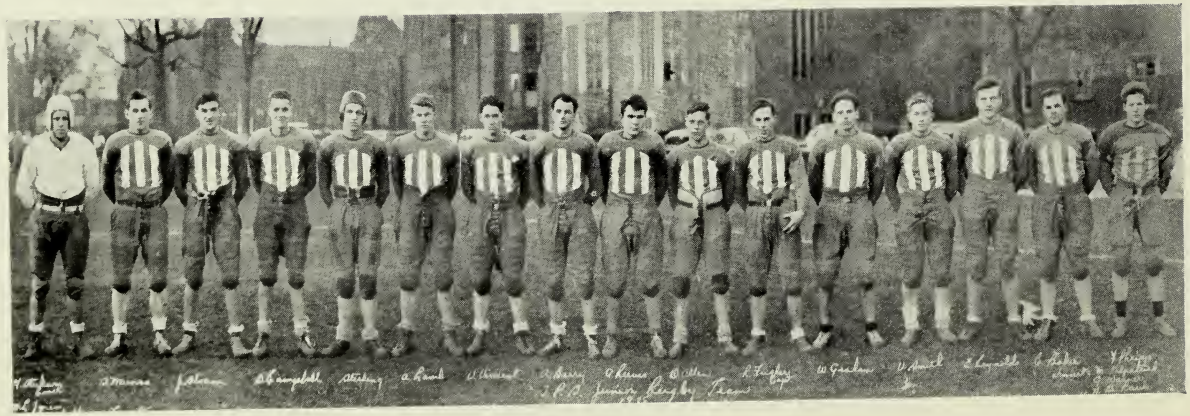
Prominent on the team were Patterson for his kicking, Williamson and Grosskurth for their plunging and running; but the whole team showed plenty of the "old fight" and with most of the boys coming back for a more successful campaign.

Junior School proved themselves to be the team to beat this year when they advanced, unbeaten, to the Mulock cup finals.

Grouped with Victoria and U.C. they experienced very little difficulty during the regular schedule. The season opened with a 13-1 win over Vic and in the second game, they eked out a 2-1 victory over U.C. The return game with Vic was a battle all the

SENIOR RUGBY TEAM

W. Murray, W. Patterson, T. Keefer, A. Chisholm, E. Bridgland, E. Watt, J. Christo, M. Creet, R. Forrester, A. Holden, A. Black, G. Woods, J. Ford, M. McPherson, R. Milne, Y. Williamson, *Captain*; E. Galway, J. Busley, J. Grosskorth, J. Rodzik, L. Chambers, F. Cooke, *Manager*.



JUNIOR RUGBY TEAM

F. Stukus, *Coach*; S. Monro, J. Sloane, D. Campbell, J. S. Stirling, A. Lamb, V. Vincent, A. Barry, G. Reeves, D. Allen, R. Fugler, *Captain*; W. Graham, V. Smith, E. Reynolds, C. Baker, F. Phripp. *Absent*: F. Phripps, E. Warner, N. DePaul.

way, with the boys from School emerging triumphant by a 3-0 score. Munro's plunging was the feature of the game.

The final scheduled game against U.C. was more or less a foregone conclusion and the boys lived up to expectations, taking their fourth straight game with 14 points while holding U.C. scoreless.

S.P.S. drew Dents for the play-offs in the Mulock Cup Series and in spite of a very ragged brand of football came through with a 13-9 win.

In the final game School lined up against a much heavier team but for the first part of the game, seemed to hold their own. However, toward the end of the first quarter, the advantage became noticeable, when the medicos crashed through to block Fugler's kick on the School 8-yard line. Meds recovered and on the second play, scored a touchdown which was converted. Fugler kicked for a single in the second quarter and the half ended 6-1.

School came to life in the third quarter and on a series of lovely running and passing plays advanced to the Meds ten-yard line. The ball was finally carried over by Munro after 3 plunges. The convert failed and a few minutes later, Meds kicked a single. In the fourth quarter, Fugler kicked another single for School but Meds staged a long march on successive pass plays which ended in a converted touchdown. The game ended with School trailing 13-7.

Dinghy Racing

An innovation took place last autumn with the introduction of Dinghy Racing into Intercollegiate sports circles. Led by two Schoolmen, Tedman and Easson, Varsity took the title from the representatives of McGill, Queen's and R.M.C. Later these two "salts" journeyed to Boston in a team of four to compete in the American intercollegiate races and placed 6th in a field of 29 which is a creditable showing in any race.

Hockey

The School hockey teams were all strong this year, with a few former Intercollegiate and T.H.L. players in the line-ups.

SENIOR HOCKEY TEAM

Second Row: G. Wood, *Coach*; T. Smart, B. Galway, E. Galway, E. P. Bridgland.
First Row: R. Scrivener, W. Pringle, D. Turner, B. Moriarity, H. Mole.
Absent: J. Grier, W. Disher.

The Seniors began their schedule with a 3-1 victory over Junior Meds. R. Galway (with 2) and Bridgland were the School marksmen, with the fast-skating Mole also showing up well.

Galway, Pringle and Bridgland shared the scoring honours in the next game with Turner kicking 'em out in fine style to shut out Meds 3-0.

St. Mike's handed the boys their first set-back. Moriarty was the lone scorer, with the final count at 2-1. The next game ended at a 4-all tie with Trinity. R. Galway was again the star with three goals, while Pringle notched up one.

Pringle and Mole scored in the next game to hold St. Mike's to a 2-2 draw, while the back-checking of E. Galway showed up well. Largely due to the efforts of Turner in goal, and Disher, Pringle, and Bridgland on defence, School shut out Trinity 1-0 in the next game. Scrivener accounted for the School goal.

School III displayed a fine brand of hockey to romp through their schedule with only one loss.

Robinson and Spence led the team to a 2-1 victory over Aerial Navigation in the opener and Robinson was again instrumental in the 5-0 win against Emmanuel, collecting two goals. Garcia, Ballagh and Kelly marked up the other counters.

U.C. III were the next victims in a close 1-0 decision, and the first half of the schedule ended with a 3-0 win at the expense of O.C.E., with goals by Robinson, Garcia and Kelly.

Forestall played a fine game in the 2-1 win over U.C. III, with Cavanagh and Cameron collecting the scoring honours.

After lapsing into a 1-all draw with Emmanuel, the lads came back to beat Aerial Navigation 5-2.

The last game in the schedule was a 5-1 trimming handed out by O.C.E.

Thompson in goal played stellar hockey throughout the season, with three shut-outs.

Junior School Hockey

With such stalwarts as Doug. Marshall, former star of T.H.L. circles, and Wally Glynn, ace forward of last year's Varsity Juniors, the Junior School looked like the best sent over in years. Throughout their schedule they showed plenty of weight on the rearguard and lots of speed "up front".

JUNIOR HOCKEY TEAM

Second Row: R. Spence, J. McLinden, S. Munro, G. Wood. *Coach*; E. Weir, W. Robinson.
First Row: W. Glynn, D. Crichton, *Manager*; W. Moore, D. Marshall, A. Lambe.

School opened the scoring in the first game on an early goal by Weir, only to have Dents come through in the dying moments to tie it up.

The team proved their worth in the second game when they ousted Vic, last year's champs, 2-1. School took the lead in the first period with goals by Glynn and Spence. The Vic goal came near the end of the third period.

Crichton and Glynn shared the scoring honours in the next game with U.C., which ended 2-all.

Dents handed down the only defeat of the year. Robinson and Glynn were the only scorers while Dents chalked up four counters.

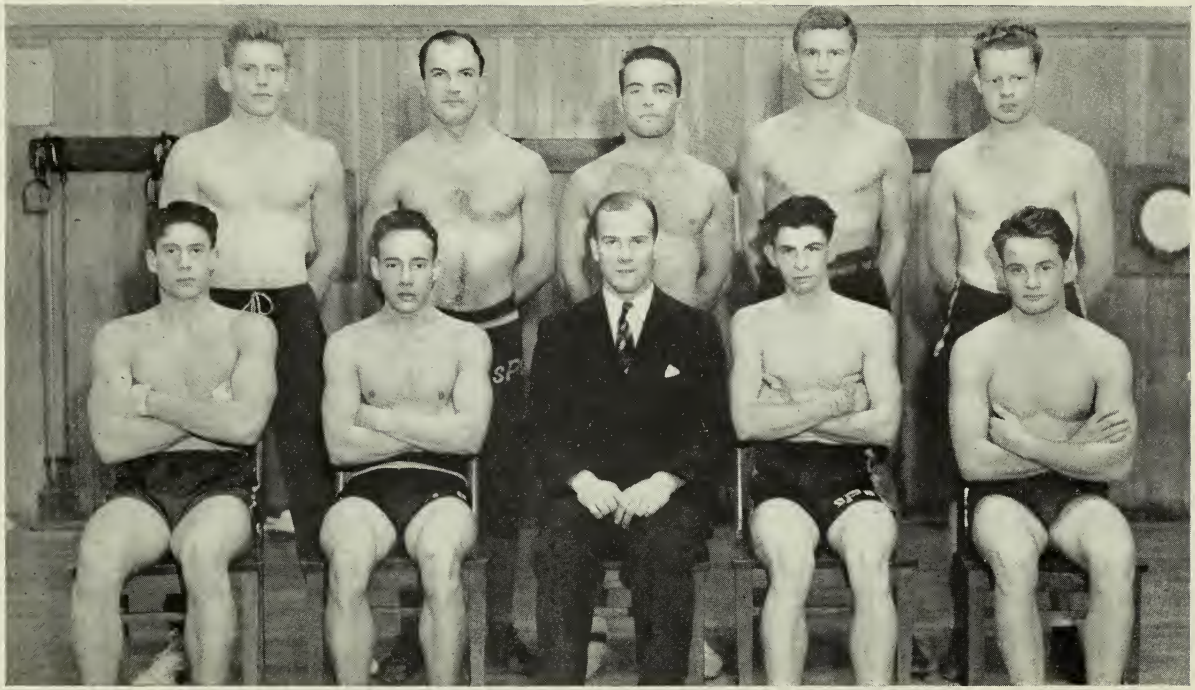
School were again the "winnahs" on the return game with Vic. The Crichton, Glynn and Spence line divided the spoils in the 3-2 victory. The season closed with a tie game with U.C. Glynn got the only School goal.

B. W. & F.

Once again School won the Davidson Cup, representing B.W. & F. supremacy. Nine fighters and two fencers made the Senior Intercollegiate team, and of these, nine won intercollegiate titles. Scott, at 175 lbs; Schwenger, at 165; Dobson, 135, and Mustard, 125, are all intercollegiate wrestling champs, while J. Pigott at 165 lbs.; Hood, 125; and Ramore, 145, carried off the boxing honours in the big assault. Garcia and R. Wilson downed all opposition in the fencing. Buchan wrestling at 145, and Currie in the 175 boxing, both won interfaculty titles but were beaten in the intercollegiate. Mees won the 145 boxing at the Junior Assault, and Swick the 125 class in the Senior.

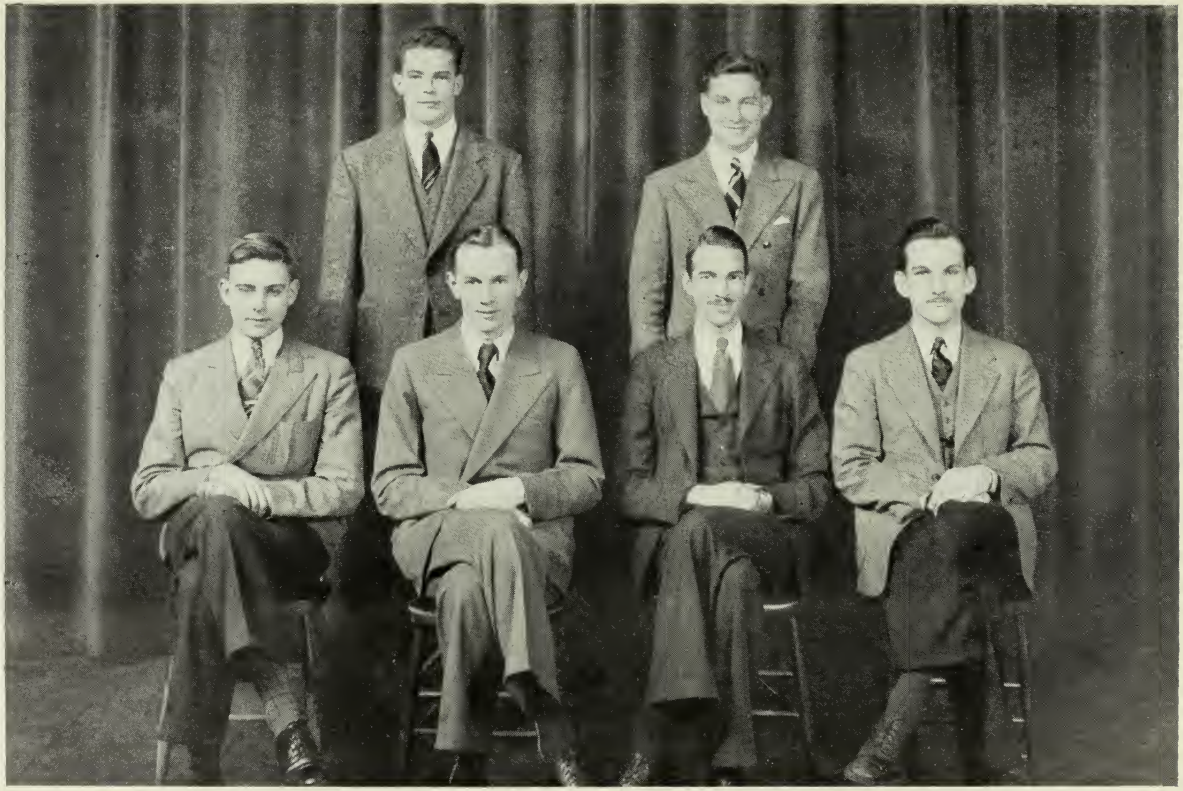
Tennis

Pigott and Shorter represented School on the Senior tennis team as No. 2 and No. 5 respectively. Bill Pigott regained his Intercollegiate crown in the singles and also represented U. of T. in the doubles final.



BOXING AND WRESTLING TEAM

Second Row: W. Wachsmith, A. B. Scott, B. Schwenger, J. Piggott, J. M. Currie.
First Row: B. Ramore, N. Mustard, D. Barnes, A. Hood, F. Dobson.



SENIOR WATERPOLO TEAM

Second Row: B. H. M. Tedman, W. Veal.
First Row: T. Kingsbury, W. Laari, *Manager*; H. de V. Partridge, L. Chambers.

Golf

Out of the many entrants in the interfaculty tournament, Morse and Spence were the only Schoolmen to catch berths on the Varsity. Both won their matches to help U. of T. carry away the cup.

Belfry was a member of the winning intercollegiate team, and broke even on his match in London.

Senior Water Polo Team

S.P.S. Senior water polo team was of an excellent calibre and consisted of many experienced hands, but they could only be assembled complete for a game on one occasion, when they tied Trinity 1-1. On the other occasion they fought Meds to a 1-1 tie with only 6 men. We always maintained that 7 Meds were not as good as 6 Schoolmen; in fact the ratio is much higher, but it does not apply to water polo.

Lloyd Chambers continued to play his usual good game as forward. The fast swimming, hard shooting Veale distinguished himself at centre.

In goal the many-handed Tedman played an excellent game, but found he was too well blessed when he played forward. Vic and U.C. gave him no chance to get cold in the goal.

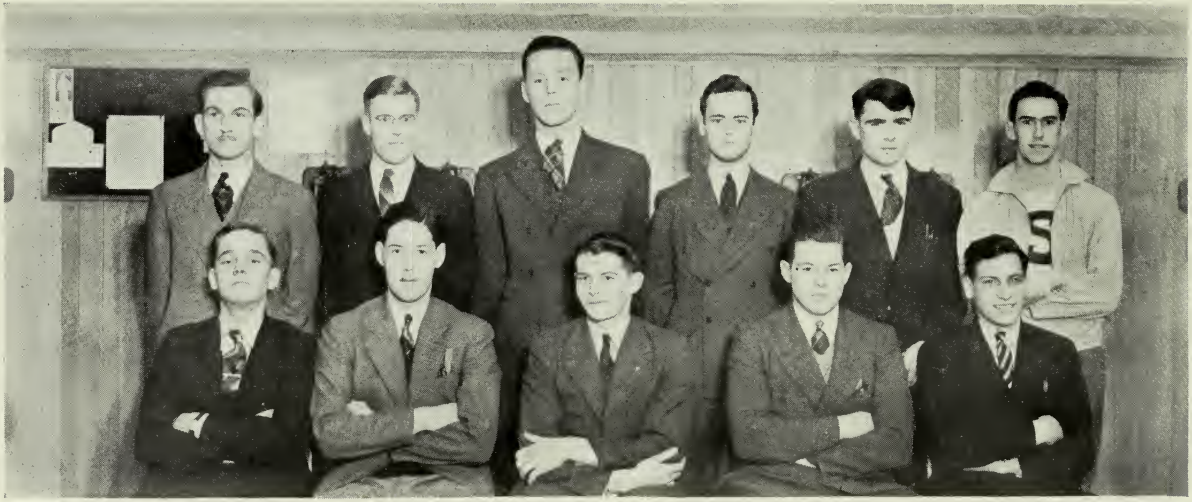
Orok and the long-armed Partridge were dangerous men despite their opponents' man advantage in most of the games.

Our very busy editor, Bill Usatis, saved the day on numerous occasions.

The faithful and hard-working manager, Bill Laari, deserves much credit for his honest endeavours in trying to keep his wandering cohorts together.

Junior School Water Polo

The first Junior School water polo practice after Christmas brought to light no fewer than fourteen aspirants. Of this number, only three or four had had previous experience at the game, but what was lacking in experience was supplemented by enthusiasm. The result was a team which School might well be proud of.



JUNIOR WATER POLO TEAM

Second Row: L. Chambers, *Manager*; F. Lysaght, F. Edenden, R. Byrnes, G. Reeves, W. Wallace.
First Row: J. Fowlie, D. Allan, J. H. Turner, J. W. Bell, F. DeMarco.
Absent: J. G. Bell, W. Hardy, F. Girvan.

SENIOR BASKETBALL TEAM

W. S. Thompson, H. Ronson, R. Rule, B. Ballagh, *Manager*; S. Murray, L. Johnson, G. Kirby.

The playing season was a strenuous one and ended with School being nosed out of a play-off position by a strong Junior Meds team.

Every member of the team performed well and improved every time out. Jack Bell, in goal, showed real class, while Jim Bell at centre and De Marco at rover were standouts. Girven and Reems added punch to the forward line and ably supported by the other members of the squad presented a well-balanced aggressive team.

Next season with these players in action again, and improved with experience, we can expect to see the Eckhardt Trophy brought back to the Little Red School House again.

Basketball

With plenty of talent on hand and in search of extra points in the Reed Trophy competition, School entered four teams in the interfaculty race. The Senior team looked well in the pre-season practices but were unfortunately grouped with the strong Vic entry. They dropped their first game to Vic 27-18 in a closely fought game, but came back to beat Senior U.C. 26-14, with Fisher and Ballagh playing good basketball for School. Their next game with Senior Meds resulted in a 19-all draw in a very close-checking game. On the return game with Vic, School were again the losers, on the small end of a 37-16 score, but took the Meds encounter by default.

Junior School Basketball

The Juniors were our strongest entry in the hoopster's contests but dropped their first game to Junior U.C., 21-18. In the second game of the series they came into their own and took Junior Vic into camp, 31-12. Finlayson, of last year's Varsity Intermediates, led the scoring with 10 points. Meds were next on the list and School came out on top 30-20. Bell was outstanding for School.

Looking for revenge with U.C., the lads put up a great fight to tie 28-28 and then downed Vic once more 26-17, with Allen playing his best game of the year for School.

The Juniors closed the schedule tied with U.C., and should pull through with a win to get into the play-offs.

JUNIOR BASKETBALL TEAM

Second Row: J. E. Reynolds, C. E. Doeringer, N. T. Barratt, J. W. Bell, D. G. Finlayson.
First Row: W. Wallace, M. A. Kilpatrick, L. Pancer, C. W. E. Shorter, A. W. Halford.

SOCCER TEAM

A. D. Moore, J. I. Thompson, C. E. P. Mudie, N. J. Mould, J. B. MacMillan, E. B. Wilson, C. H. Vatcher, R. S. Smart, J. B. Moore, P. A. Harakas, Professor E. A. Allcut.
Absent: George Kennedy, J. Grosskurth.

III Basketball

The Third team opened the season with an 8-6 win over Vic III, but dropped the second game to Meds 29-12 in a rather one-sided contest. Paced by MacDonald and Pile, the boys took the next one by a 25-20 margin. Meds proved by far the better team in their next meeting by piling up 55 points as against 21 for School.

IV Basketball

The Fourth School entry emerged victorious in their opener by downing Trinity "B" 19-15, with MacCallum playing best for School, and repeated by walking all over Wycliffe's "B" team. Both MacCallum and Simpson were prominent in this 21-5 win.

The next game was close all the way, with Meds IV nosing the Schoolmen out 13-12. Dents also proved themselves a little too much for the boys, taking them into camp 29-15.

Soccer

School boasted a fine soccer team this year and, if it had been organized early in the season by regular practices, School would have gone much further in the cup competition. The work of organization is too much for the captain and an enthusiastic non-playing man should be obtained to hold the team together so that School might again regain the trophy. The present forward line will be back next year intact. They should elect a Grad or Undergrad as manager and if possible secure the services of a coach.

Harakas and McMillan were our scoring threat and they combined on many well-planned plays to secure the season's goals.

Bing Thompson who has served School well for four years, played very well at centre-half and started the forwards on to success on many occasions.

George Kennedy and Grosskurth did their part in earning two shut-outs against U.C. and kept the Vic snipers from scoring too heavily.

Well, School Soccer fans, who did their bit this year, "Thanks", and may you gather in some new material from the Freshmen and other years and may you return the Arts Faculty Cup to S.P.S.

TRACK TEAM

Second Row: G. Foulis, W. Hogg, H. Coons, D. Finlayson, W. Thompson, J. Thompson.
First Row: T. Kingsbury, G. McHenry, G. Piper, D. Crichton, J. Goodwin.

SENIOR LACROSSE TEAM

L. Woods, W. Atkinson, A. Douglas, R. Rule, B. Ballagh, S. Murray, F. Brown, M. Robinson, G. Kirby.

JUNIOR LACROSSE TEAM

B. K. Smith, J. E. Quist, G. E. W. Reeves, F. S. Radmore, F. I. Belford, H. D: Cornish, J: K: Major, H. M. Robinson, *Manager*.

Absent: E. W. Beggs, C. F. Starr.

We must also pay tribute to two Schoolmen G. Powell, and G. Fraser who shared in the glory of the invincible University Eleven who won the Inter-University Championship with ease. Bing Thompson of School played well on the second team.

Track and Harrier

This year School relinquished their hold on the outdoor track championship which they have held for the past two years and placed second to Vic. Dave Crichton was the individual star of the meet by virtue of his victories in half-mile and the mile with a new interfaculty record in the half. McHenry pulled down wins in his specialties, the 100 and the furlong. Hogg ran a lovely race to win the 3-mile.

Unfortunately, Crichton was ineligible for Intercollegiate Competition but McHenry, Hogg and Coons knocked down berths on the Senior team.

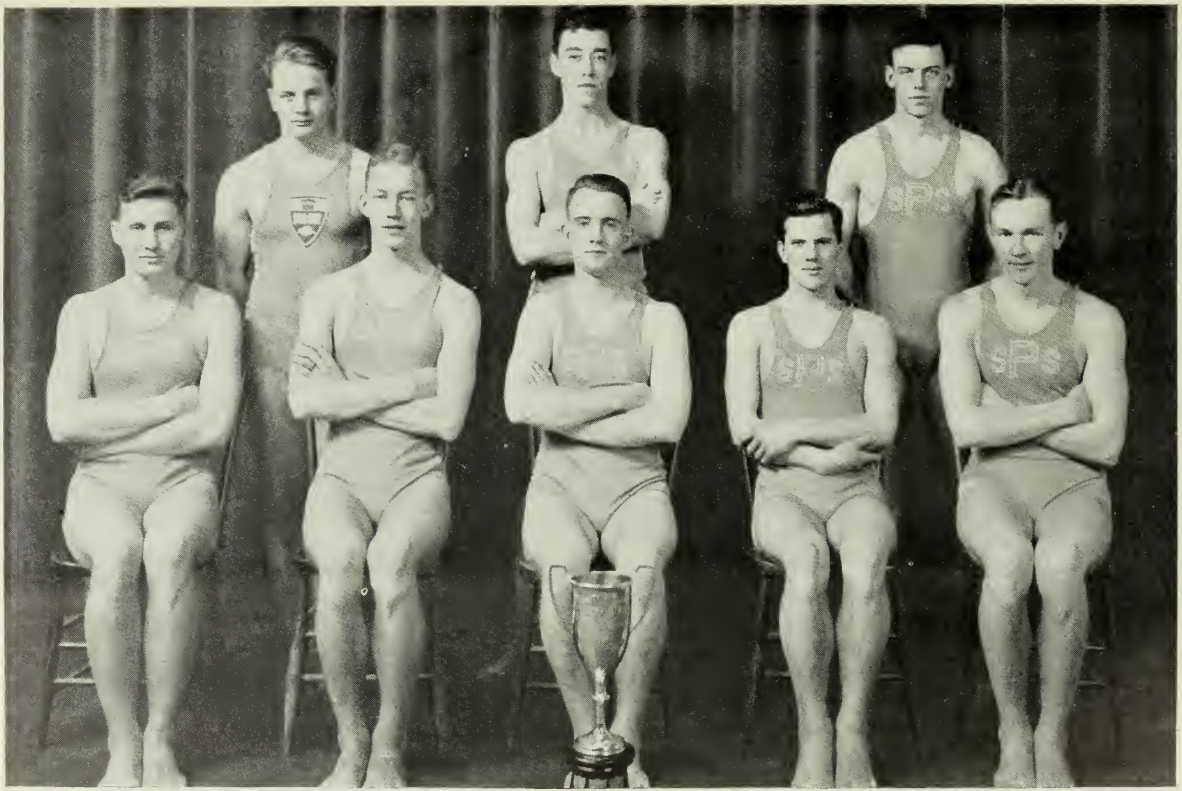
Hogg was best man on the University Harrier squad winning in the race with Buffalo State and placing third in the Intercollegiate. Finlayson and Foulis, two other Schoolmen also turned in some fine performances throughout the season.

Senior School Lacrosse

Senior School Lacrosse this fall saw pretty well the same team which had won the Dafoe Cup last year. We were not as successful, however, as Victoria, a grand team, put us out in the semi-finals.

This year marked the end of the Inter-faculty careers of Murray, Ballagh, Atkinson, Rule and Robinson. These fellows won the Dafoe Cup three years, and tried hard to make it a fourth. They must be getting old though, because this year condition and the old zip seemed to have decreased somewhat. Lennie Woods fresh from his starring trip West for the Dominion Championship with Mimico, turned in the finest goal-tending efforts ever seen in Hart House. Arn Douglas, Brown and Fightin' Gord Kirby played an excellent game of lacrosse for School and our defeat was not in any way attributable to their fighting spirit.

Lacrosse got quite a boost this year, with thirteen teams entered in the League. This shows that interest is increasing in the game



SWIMMING TEAM

Second Row: F. Dobson, J. Girvan, D. Harkness.
First Row: W. Veal, R. Hardy, D. Jennings, *Manager*; W. Staples, W. Laari.

JUNIOR BASEBALL TEAM

Second Row: J. E. Reynolds, J. S. Munro, W. A. Robinson, B. J. Moriarty, *Manager*; A. J. J. Barry, J. R. Fitzpatrick.

First Row: H. E. Perks, H. L. Coons, O. K. Smith, W. A. Robinson, J. Hirchorn, C. L. Baker, J. M. Leitch.

SENIOR BASEBALL TEAM

Second Row: W. C. Krane, P. J. McCabe, G. Kennedy, J. C. Anderson, *Manager*; G. M. Scott, F. R. Gerry, W. Diak.

First Row: F. W. Philpott, F. G. Brown, G. A. Renshaw, B. J. Moriarity, R. R. Rule, M. W. J. Howe.

and with School able to field three teams we haven't a doubt in the world but that the old mug will be back in the Red Schoolhouse in 1940.

Junior and Intermediate Lacrosse

School had Lacrosse teams of which they can be proud, although they did not win any group.

Junior School lost their group to the classy Dent team by a close margin of one goal. The outlook for next year seems very good with Quist, Radmore, Belford, Reeves and Grant left to build around, while Senior School will be benefited by Starr, Magor, Smith and Beggs.

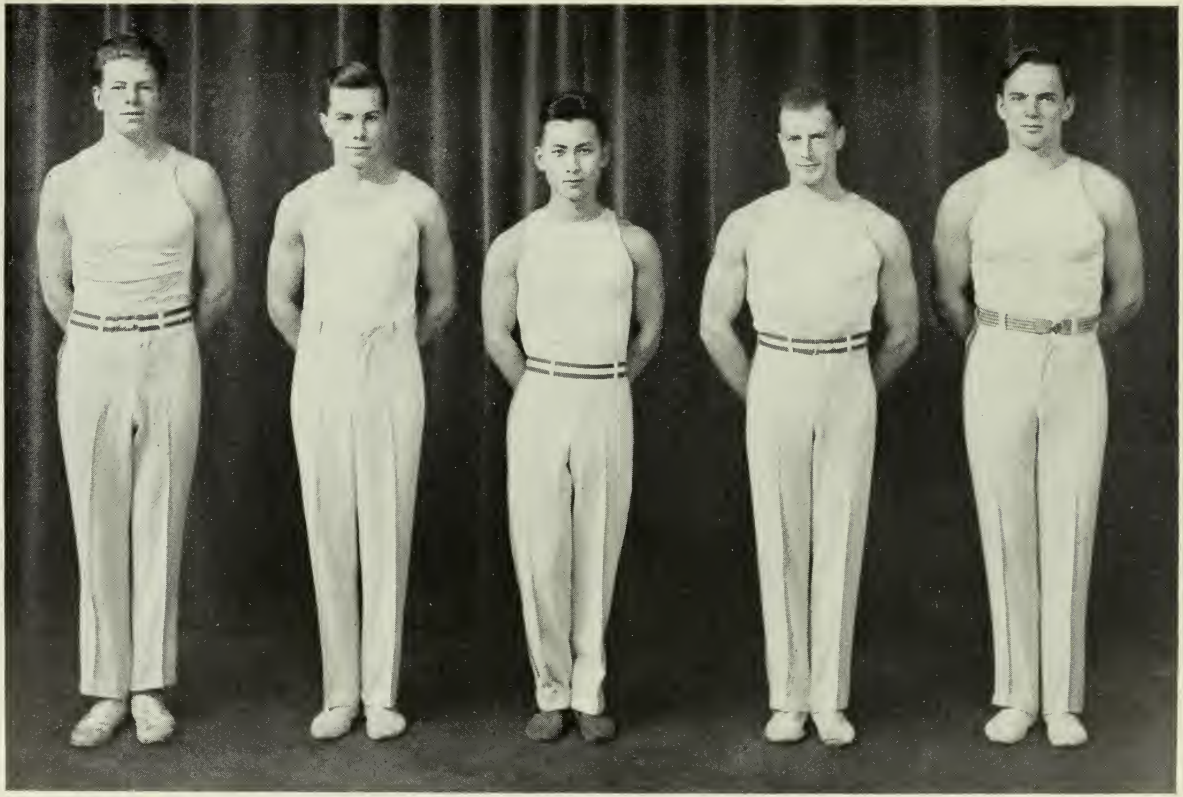
In third School we had a team which showed annoying fighting spirit, and although they finally lost the group to Pharmacy they at least defeated every team once. Some of the players on this team were new to the game, but showed fine ability. Hood (in goal), Galway and Moriarty were the best of the newcomers, while the old hands, Wheaton, and Jones along with McGrath, Steele and Almack provided a real School team.

This third team was very successful in its purpose of developing new players and if continued the Dafoe cup should soon return to School.

Baseball

School also had four entries in the baseball series with a fair amount of success all round. Galway pitched nice ball in the opening game to hold Vic scoreless, while the sluggers drove two runs across the plate. Senior Meds, last year's finalists, piled up a nice lead at the beginning of the next game which School could not overcome. The game ended 8-5 in favour of Meds. Senior U.C. proved to be easy prey and ended up at the bottom of an 8-3 tally, in their first game, and defaulted the second. Senior Meds shut the boys out 2-0 in their return game and the season ended by dropping the last one to Vic, 8-7, due to the lack of a full team.

The Junior team proved to be the strongest of the four. They opened the season with a decisive 17-6 victory over U.C., featured by the heavy hitting of Reynolds, Munro and W. Robinson; but were beaten by Meds 7-2 in the next encounter. Junior School overcame an early Vic lead to eke out a 10-8 win, but were held to a 10-all tie in the return U.C. game. The stellar pitching of Robinson was largely responsible for the 5-4 win over Meds.



GYM TEAM

D. Craig, T. A. Jull, W. Mark, L. Patterson, H. Powell.
Absent: W. Lester.

The Third team took their opener from St. Mike's by piling up a 6-run lead in the first innings and holding even with their opponents throughout the game to lead at the end 9-4. However, they dropped the return game 3-2 in a very close battle. Wycliffe defaulted their game, giving the team a good chance of making the play-offs.

S.P.S. IV won their first game against U.C. 9-4, with a 6-run splurge in the third inning. Aerial Navigation were the next victims in a 14-6 win featured by the slugging of Waite, Lambe and West. U.C. won their return game by default, and a slug-fest with Aerial Navigation resulting in a 17-9 win, put the lads at the top of their group.

Swimming

S.P.S. again took the Interfaculty swimming title this year, piling up a score of 29 points. School won both relays; Girvan took the 200 yard breast stroke and Staples was the winner of the 100 yard back stroke. The other points came with seconds in the diving and back stroke by Dobson and Jennings respectively.

S.P.S. Gym Team

The S.P.S. Gym Team lived up to its usual high standard of quality again this year. Our Senior Team was made up of the same men who won the championship last year, but this time a few bad breaks served to set them down, and they were nosed out by Victoria College. The Junior Team led by D. Craig put on a fine performance but here again School was unsuccessful and won only a second place.

For individual work, L. Paterson was the best this year, and though he gained a low standing in the interfaculty he made a brilliant showing in the intercollegiate, to take second place. W. Lester last year's intercollegiate champ gave his usual brilliant performance, but this year did not do quite as well. Willie ("Horatio of the High Bar") Mark was again the outstanding performer on the high bar with his slow motion exercises one of the most difficult tricks possible, and held the spectators spellbound at every performance.

The Junior team with D. Craig and T. Jull, may be looked for in the future to be just as good as the present one, and though the Wilson Cup has been lost for this year, School will have ample chance of regaining it next year.

"S" HOLDERS

Fourth Row: G. Wheaton, P. Patterson, G. Powell, G. Kennedy, T. Kingsbury.
Third Row: G. Currie, R. Wilson, D. Hutton, W. Rodzik.
Second Row: R. Rule, R. Galway, W. Ramore, J. Ames, J. Anderson, R. Orok.
First Row: W. Laari, A. Hood, W. Hogg, J. F. Ford, F. Dobson, F. Philpot, M. Robinson.

"C" Company C.O.T.C., 1938-39

LIEUT-COL. MADILL

A review of the current training season shows a variety of interesting developments. As was to be expected, following the international tension of last September, the opening of the academic term saw an increasing interest among undergraduates in Corps activities. This was revealed by the numerous inquiries received for information on courses of study leading to officers' qualifications, and the rapid enrolment of three hundred undergraduates from all faculties. Training was given in the following branches of the Service: Artillery, Artillery Survey, Engineers, Signals, Infantry (rifle), Infantry (machine gun), Army Service Corps, and Medical. Successful candidates in War Office examinations for "A" and "B" certificates qualified for commissions of Lieutenant and Captain, respectively, in the Defence Forces of the British Empire. At the present time many are taking advantage of the splendid opportunities for military service available to those holding certificates.

Our first important function was to furnish a guard of honour and band, under command of Major W. S. Wilson, for the Remembrance Service at the Memorial Tower on November 11th. Under the leadership of our President and Honorary Colonel, Dr. Cody, the great gathering of staff, students and friends felt deeply the significance of the occasion.

MAJOR WILSON

There followed on Sunday, November 13th, our first church parade in recent years. We marched in a light rain to St. Paul's

Anglican Church, accompanied by the 110th City of Toronto squadron of the R.C.A.F., and were privileged to share in the service as conducted by Bishop Renison. The church parade will no doubt continue to be a regular feature of the training season.

MAJOR WATSON

During the battalion parade of Friday, December 2nd, a platoon of the Royal Canadian Regiment gave a stimulating demonstration of infantry drill, with full equipment, as practiced under the new organization. Following the parade, all ranks enjoyed the everwelcome sandwiches and coffee at Hart House.

Early in November, a large and enthusiastic committee, under the chairmanship of our popular Captain Bobbie Barron, began to work on plans for the Annual Ball. When details of the complete and elaborate arrangements began to take form, it became very apparent to all how necessary it was to have a large, hard-working committee of enthusiasts. We have for years been proud of the distinction of producing one of the best of the many fine parties held in Hart House. That of January 13th, 1939, was an outstanding success, and will not soon be forgotten by those who were fortunate enough to be present.

Since then, with the prospects of certificate examinations and the annual inspection early in March, our interests have taken a more serious turn. As a rule the annual inspection concludes the training season. This year, the climax will occur on May 22nd, when King George VI and Queen Elizabeth are in Toronto. We are to enjoy the exceptional honour of sharing in the arrangements for their welcome to the University. This will be a rare opportunity for all members of the C.O.T.C. who are able to be present.

"C" Company, with an enrolment of one hundred Schoolmen, continues to be the largest company. Engineering undergraduates are favoured by the fact that they may qualify for more branches of the Service than undergraduates of other facilities.

"C" Company came first in "Weapon Training" this year, with an average of 66.4. The best shot in the contingent was Sergeant W. E. Steeves, of "C" Company, with a score of 110. The second and third best shots in the Company were Cadets W. J. Wallace and J. E. Work. All will receive cash prizes.

Lieutenant-Colonel H. H. Madill, V.D., Head of the School of Architecture, commands the contingent, and Major W. S. Wilson, Secretary, Faculty of Applied Science, is second in command.

"C" Company officers are:

Major M. B. Watson
Captain G. T. Hodgson
Lieutenant G. T. Maher
Lieutenant W. H. Bonus
2nd Lieutent J. H. Galbraith.

Rifle Association

The University of Toronto is the home of one of the two existing civilian rifle clubs in Canada. It has its winter headquarters in the indoor range in Hart House which incidentally is considered to be among the finest equipped galleries in this city. Schoolmen find here a sphere of activity in which they excel as scores and prizes indicate.

The Club this year had a membership of over seventy, about one third of whom were engineers. The School team composed of Cliff Miall, Warwick Steeves, Len Stanners, Dave Staples and Bing Thompson once more won the coveted Mitchell Cup for indoor shooting with a team score of 971 out of 1000 to give a decisive margin over their rivals from other faculties. On the University team were the same five making good scores to help round out a team total of 1479 out of 1500 in the Dominion Inter-University match.

Club activity in the fall took the form of long range outdoor shooting with the .303 calibre. Saturday afternoons and the odd half holiday during the week (whether official or otherwise), found members of the association sending lead into the butts at the Long Branch ranges. With ammunition gratis, this provides an opportunity of enjoying outdoor shooting that no Schoolman should miss. The season ended the last week in October with the opening of the indoor range following immediately. Indoor shooting continued until the range closed on March 9th.

The Rifle Club offers to its members a wonderful opportunity to really enjoy shooting. Competitions and prizes are plentiful with grouping arranged to give each one an equal chance. Our word to you is this—if you can shoot, we need you; if you can't, we'll teach you.

J. I. Thompson, *Team Captain.*

THE UNIVERSITY OF TORONTO ENGINEERING SOCIETY

BALANCE SHEET

AS AT 31st MARCH 1939

ASSETS

1937-38				
	CURRENT			
$ 87.94	Cash on Hand		$ 153.59	
	Bank Balances			
646.09	Savings Account	$ 649.37		
1,873.40	Current Account	1,920.84		
			2,570.21	
641.71	Accounts Receivable		591.25	
2.03	Suspense—Returned Cheques		10.85	
2,198.88	Merchandise Inventory		2,210.84	
$ 5,450.05				$ 5,536.74
	INVESTMENTS			
	Dominion Government and Government			
4,000.00	Guaranteed Bonds at par		$ 4,000.00	
41.17	*Add:* Accrued Interest		41.17	
4,041.17				4,041.17
	FIXED			
1,347.39	Office Equipment		$ 1,510.94	
1,085.03	*Less:* Reserve for Depreciation		1,148.69	
262.36				362.25
	DEFERRED EXPENSES			
26.67	Unexpired Insurance			13.33
$ 9,780.25				$ 9,953.49

LIABILITIES AND SURPLUS

	CURRENT		
$ 1,059.16	Accounts Payable	$ 1,458.10	
830.50	Reserve for Dividend to Students on Fees		
1,889.66			$ 1,458.10
7,890.59	Surplus Account		8,495.39
$ 9,780.25			$ 9,953.49

OPERATING STATEMENT—SUPPLY DEPARTMENT

1st APRIL 1938 TO 31st MARCH 1939

1937-38			
$12,866.76	Sales		$14,980.09
1,938.24	Inventory 1st April 1938	$ 2,198.88	
9,914.97	Purchases	11,647.56	
11,853.21		13,846.44	
2,198.88	Less: Inventory 31st March 1939	2,210.84	
9,654.33	Cost of Goods Sold		11,635.60
3,212.43	Gross Trading Profit		3,344.49
1,496.00	Salaries		1,654.50
$ 1,716.43	Net Operating Profit		$ 1,689.99

THE UNIVERSITY OF TORONTO ENGINEERING SOCIETY

STATEMENT OF INCOME AND EXPENDITURE

1st APRIL 1938 TO 31st MARCH 1939

				1938-39
	INCOME			
$ 1,661.00	Fees		$ 1,845.00	
195.25	Interest on Investments		193.28	
1,716.43	Net Operating Profit from Supply Department		1,689.99	
151.07	Profit from School Nite			
				$ 3,728.27
$ 5,723.75				$ 3,728.27
	EXPENSES			
$ 146.61	Donations		$ 169.36	
65.43	Election Expense		129.97	
	General Expense:			
	Delegates' Expenses	$131.80		
	Delegates' and Guests' Entertainment	87.55		
	Sundry Expenses	67.21		
	Telephone	51.35		
238.93			337.91	
25.00	Grants to Affiliated Clubs		145.00	
18.33	Insurance		18.34	
318.50	Photographs		321.00	
44.83	Printing and Stationery		41.02	
47.31	Provision for Depreciation—Office Equipment		63.66	
910.42	Publications		999.11	
84.25	Scholarships and Certificates		84.70	
352.49	School At-Home Actual Subsidy (Subsidy Budgetted for $200.00)		5.54	
250.25	School Dinner Actual Subsidy (Subsidy Budgetted for $275.00)		265.70	
	School Nite Actual Subsidy (Subsidy Budgetted for $75.00)		210.15	
$ 2,502.35				$ 2,791.46
1,221.40	Excess of Income over Expenditure to Surplus Account			936.81
$ 3,723.75				$ 3,728.27

SURPLUS ACCOUNT

1st APRIL 1938 TO 31st MARCH 1939

				1938-39
$ 7,950.17	Balance 1st April 1938			$ 7,890.59
1,221.40	Excess of Income over Expenditure for year ended 31st March 1939			936.81
9,171.57				
830.50	Dividend on Fees to Students			
267.28	Obsolete Stock Written-Off Inventory			
183.20	Sundry Expenditure applicable to year ended 31st March, net		$ 332.01	
7,890.59	Balance to Balance Sheet		8,495.39	
$ 9,171.57			$ 8,827.40	$ 8,827.40